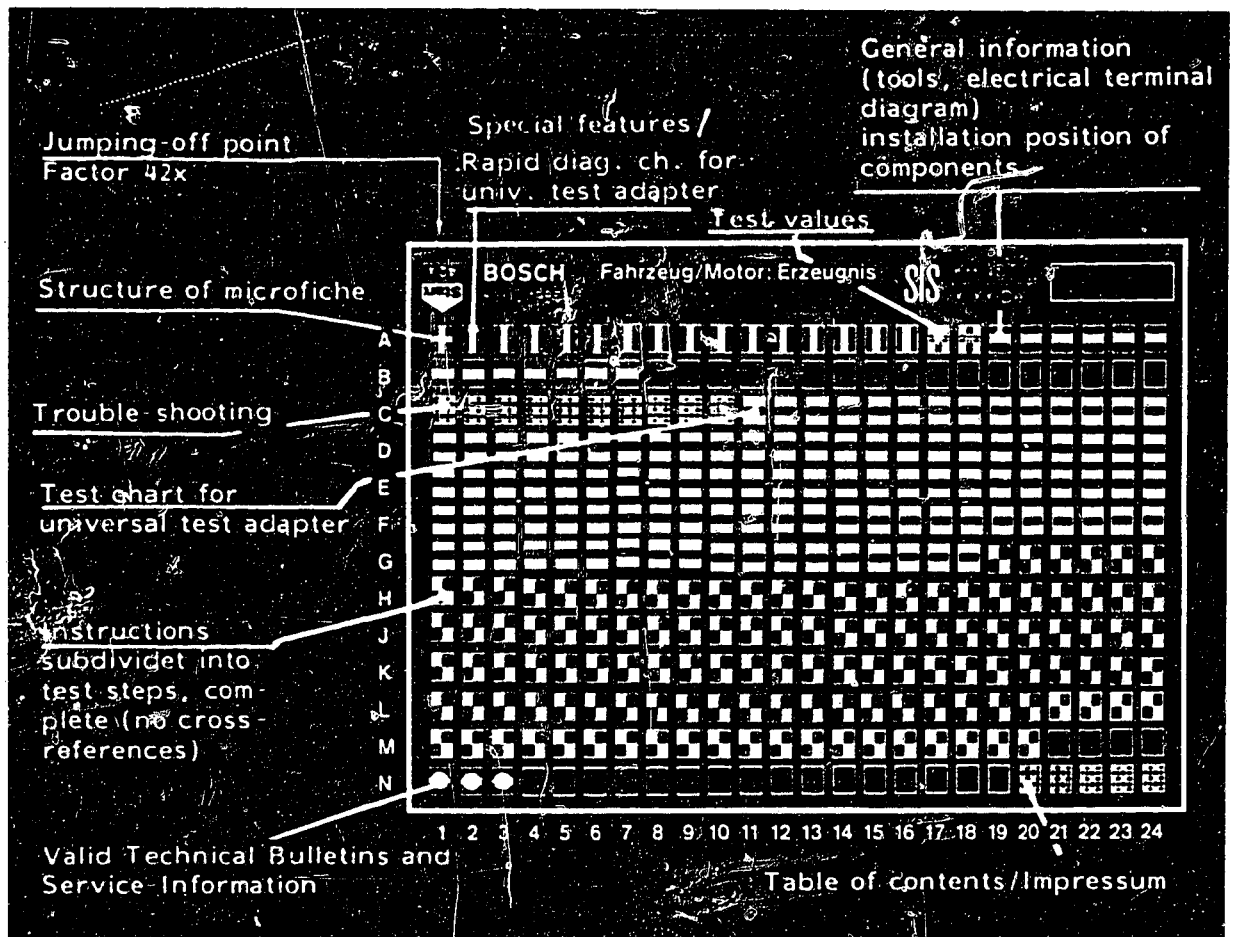


Structure of microfiche

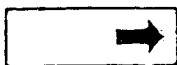


1. Read from left to right
2. Title of microfiche (appears on each coordinate)

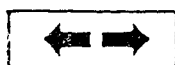
E16	Product/component/test step
	Vehicle/engine

Coordinate

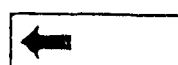
3. Limits of section



Beginning



Mid-section



End



One-page section

4. Purely vehicle-specific passages in the text are marked with a vertical bar.
5. Reference to relevant working steps in the test specifications, e.g. coordinate C6.

C6

A1

Trouble-shooting program



SPECIAL FEATURES

This microfiche card contains the testing and repair instructions for the Motronic in the

- BMW 325e for the USA, with a 2.7 1/6-Cyl. engine (12.83 →)

1. RAPID DIAGNOSTIC CHART FOR THE UNIVERSAL TEST ADAPTER

The rapid diagnostic chart that follows makes it possible for the experienced Motronic expert to check quickly the electrical portion of the system using the universal test adapter.

The rapid diagnostic chart contains the following information:

- Switch settings on the universal test adapter
- Sequence of test steps
- Notes on the operation of the universal test adapter or other components
- Reading on the multimeter and motortester
- Cross-references to coordinates for the pertinent detailed testing and trouble-shooting program.

If detailed instructions and information are required, proceed in principle according to the trouble-shooting chart starting from Coordinate C 1.












A2

Rapid diag. chart for univ. test adapter

BMW 325e (USA)



Rapid diagnostic chart for the universal test adapter

Test step	Switch setting		Notes	Test specification (reading)	For trouble-shooting, see Coordinates
	V	Ω			
1		1	Shift into neutral, ignition off. Disconnect control unit and pump relay. Measure insulation resistance of the rotational-speed sensor Term. 8 to Term. 5.	greater than 1 M Ω	C 18
2		2	Measure insulation resistance of the reference mark sensor Term. 25 to Term. 5.	greater than 1 M Ω	C 23
3		3	Measure coil resistance of the rotational-speed sensor Term. 8 to Term. 27	0.6 ... 1.6 k Ω	D 3
4		4	Measure coil resistance of the reference mark sensor Term. 25 to Term. 26.	0.6 ... 1.6 k Ω	D 7
5		5	Measure the resistance of the temperature sensor, engine (NTC II), Term. 13 to Term. 5.	at +15°C to +30°C: 1.3 ... 3.6 k Ω (dependent on temperature)	D 11
6		6	Measure resistance of the temperature sensor, air (NTC I) Term. 22 to Term. 5.	at +15°C to +30°C: 1.45 ... 3.3 k Ω (dependent on temperature)	D 13
7		7	Measure the resistance of the map switch Term. 10 to Term. 5.	less than 10 Ω	D 15
8		8	not used	---	--
9		9	Accelerator pedal is at rest position. Measure resistance of the idle contact Term. 2 to Term. 5.	less than 10 Ω	D 17
10		10	Step all the way down on the accelerator. Measure the resistance of the idle contact Term. 3 to Term. 5.	less than 10 Ω	D 21
11		11	Measure the resistance. Ground Term. 16 to Term. 5	less than 10 Ω	D 23

A3

Rapid diag. chart for univ. test adapter
BMW 325e (USA)



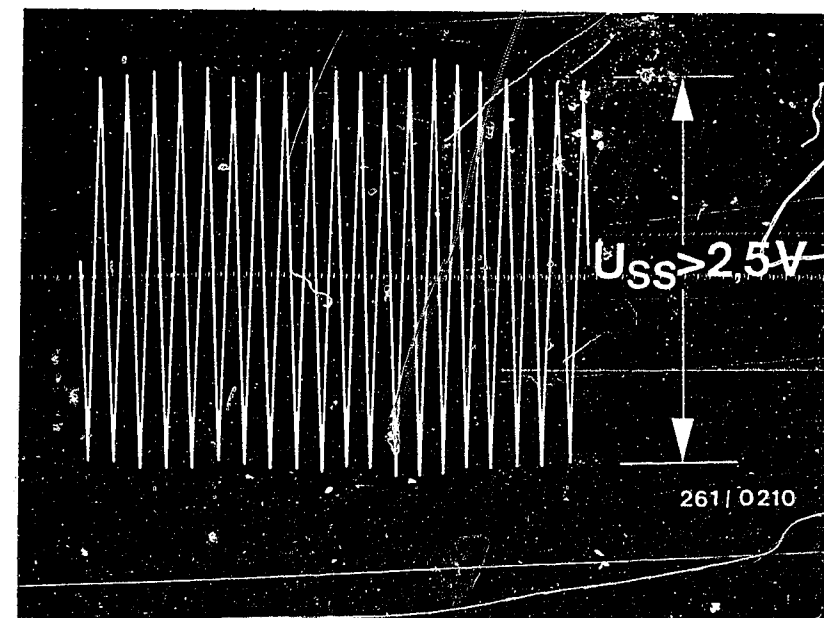
A4

Rapid diag. chart for univ. test adapter
BMW 325e (USA)



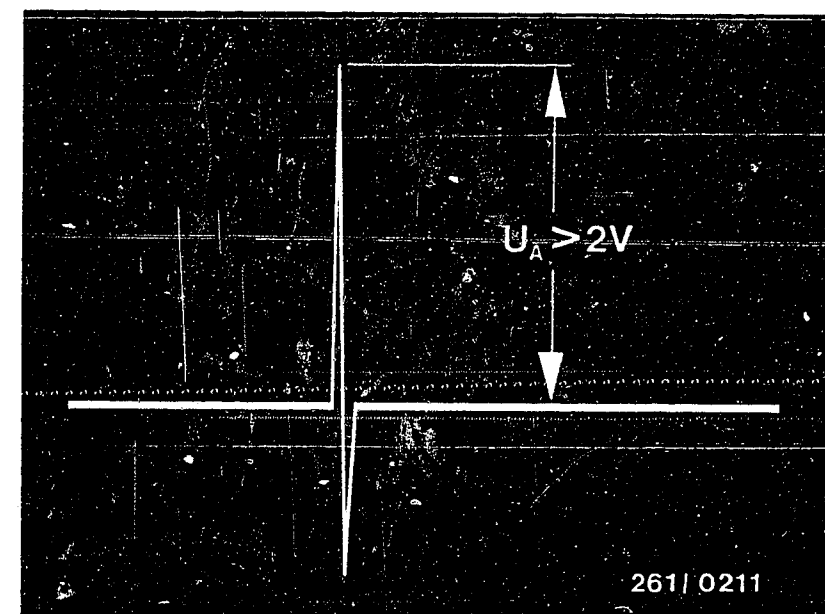
Rapid diagnostic chart for the universal test adapter (continued)

Test step	Switch setting		Notes	Test specification (reading)	For troubleshooting, see Coordinates
	V	Ω			
12	↓	12	Measure resistance. Ground, Term. 17 to Term. 5	<u>less than 10 Ω</u>	E 1
13	↓	13	Measure resistance. Ground Term. 19 to Term. 5	<u>less than 10 Ω</u>	E 3
14	↓	14	Measure resistance of the altitude sensor (pressure sensor), Term. 30 to Term. 5	<u>0.4 ... 2.3 kΩ</u> dependent on altitude	E 5
15	↓	14	Caution! Measure voltage of the altitude sensor (pressure sensor) at the Ω - sockets! Test specifications depend on altitude and battery voltage! Battery voltage between 10 and 14 V. Measurement at Term. 30 and Term. 5. Switch on the ignition.	0 m: 1.5... 3.5 V 500 m: 2.5... 5 V 1000m: 3.5... 6 V 1500m: 4.5... 7.5 V	E 7
16	1	15	Measure signal with oscilloscope, rotational-speed sensor Term. 8 to Term. 27. Shift into neutral and start the engine.	see figure at top	E 9
17	2	15	Measure signal with oscilloscope on the reference mark sensor Term. 25 to Term. 26. Shift into neutral and start the engine.	see figure at bottom	E 13



Rotational-speed sensor signal

Reference mark sensor signal.
The positive peak must come first.



A5

Rapid diag. chart for univ. test adapter
BMW 325e (USA)



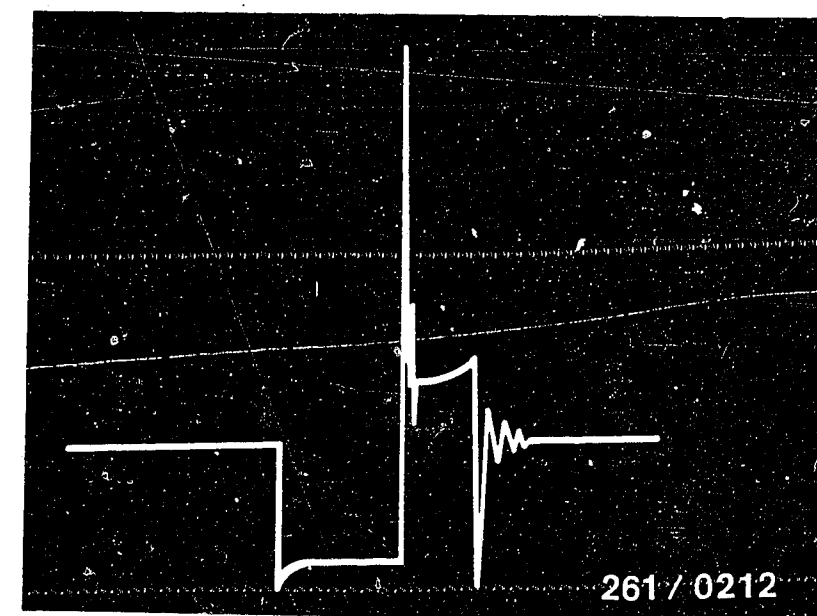
A6

Rapid diag. chart for univ. test adapter
BMW 325e (USA)



Rapid diagnostic chart for the universal test adapter (continued) Control unit 0 261 200 021

Test step	Switch setting		Notes	Test specifications (reading)	For troubleshooting, see Coordinates
	μ	Ω			
18/19	3/4	15	not used	-----	-----
20	6	15	Measure voltage from the main relay at Term. 35 to Term. 5.	<u>10 ... 15 V</u>	E 17
21	7	15	Measure voltage from the main relay at Term. 18 to Term. 5.	<u>10 ... 15 V</u>	E 19
22	5	15	Ignition off. Connect the control unit. Ignition on. Measure the ignition signal with the oscilloscope. Shift into neutral and start the engine. Control unit, ignition output stage, Term. 1 to Term. 5. Evaluation: Signal present.	see figure	E 21



Ignition signal

A7

Rapid diag. chart for univ. test adapter
BMW 325e (USA)



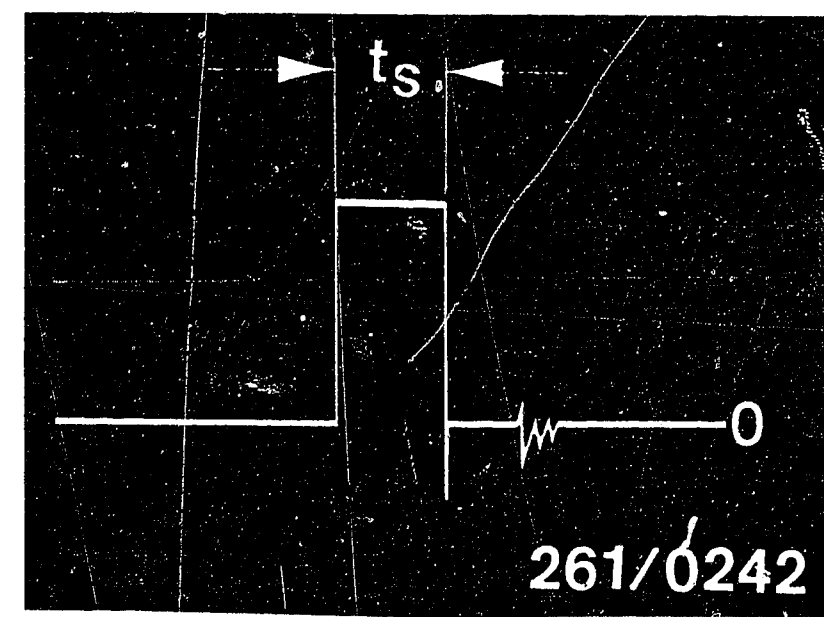
A8

Rapid diag. chart for univ. test adapter
BMW 325e (USA)



Rapid diagnostic chart for the universal test adapter (continued) Control unit 0 261 200 021

Test step	Switch setting		But-ton	Notes	Test speci-fications (reading)	For trouble-shooting, see Coor-dinates
	V	Ω				
23	8	15		Measure voltage at the control unit Term. 9 to Term. 5.	greater than 8 V	E 23
24	9	15		Measure voltage from the air-flow sensor at Term. 7 to Term. 5.		F 1
				Air-flow sensor flap in at rest position:	150 ... 250 mV	
				Air-flow sensor flap open:	greater than 7V	
25/26	10/11	15		not used	-----	-----
27	12	15		Measure voltage. Starting signal Term. 50. Term. 4 to Term. 5	8 ... 15 V	F 3
28	13	15		Check the dwell period signal t_s on the control unit using an oscilloscope. Term. 21 to Term. 5. Shift into neutral and start the engine.	see the figure	F 5



t_s = dwell period signal

A9

Rapid diag. chart for univ. test adapter
BMW 325e (USA)



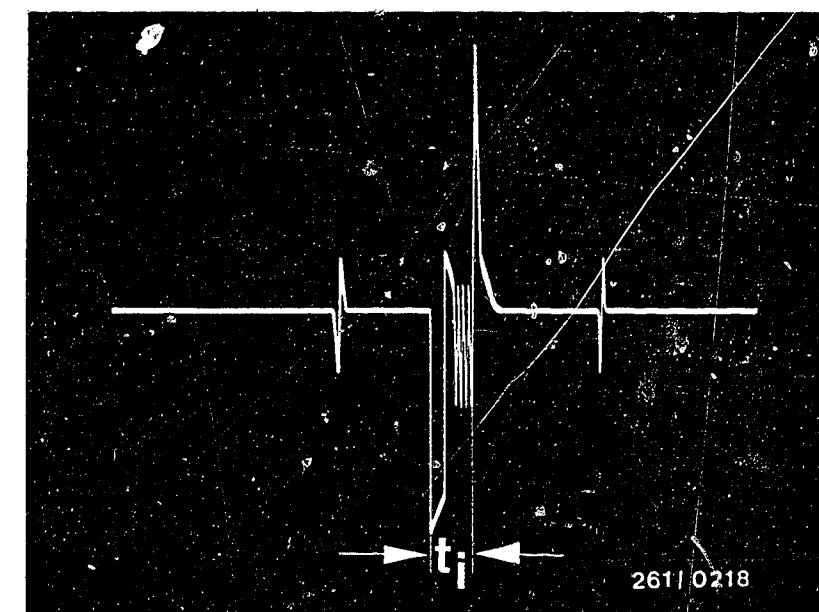
A10

Rapid diag. chart for univ. test adapter
BMW 325e (USA)

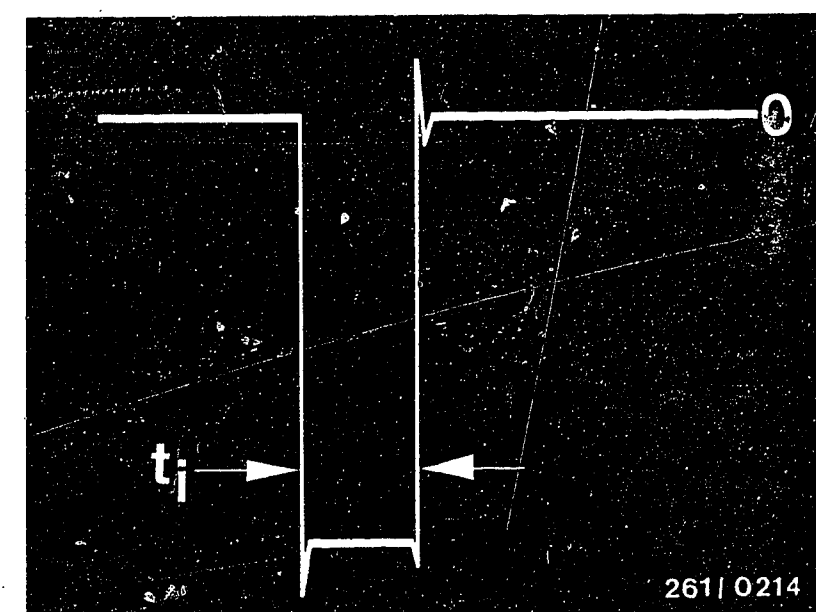


Rapid diagnostic chart for the universal test adapter (continued) Control unit 0 261 200 021

Test step	Switch setting		But-ton	Notes	Test spec-ifications (reading)	For trouble-shooting, see Coor-dinates
	V	Ω				
29	14	15		Check the fuel-injection signal t_i from the control unit using an oscilloscope, Term. 14 to Term. 5. Shift into neutral and start the engine.		F 7
30	14	15	T1	Like 29, but duration of injection comes somewhat broader after the but-ton is pressed (NTC II, cold).	see figure at top	F 9
31	15	15		Like test step 29, but check Term. 15 to Term. 5.		F 11
32	16	15		Measure the fuel-injection signal t_i from the control unit using an oscil-loscope, Term. 11 to Term. 5. Shift into neutral and start the engine.	see figure at bottom	F 13



t_i = Fuel-injection signal



A11

Rapid diag. chart for univ. test adapter
BMW 325e (USA)



A12

Rapid diag. chart for univ. test adapter
BMW 325e (USA)



Rapid diagnostic chart for the universal test adapter (continued) Control unit 0 261 200 021

Test step	Switch setting		But-ton	Notes	Test specifications (reading)	For trouble-shooting, see Coor-dinates
	V	Ω				
33	17	15		Plug in the pump relay. Measure the voltage at the pump relay at Term. 20 to Term. 5. Ignition on.	10 ... 15 V	F 15
34	17	15		Measure voltage. Shift into neutral and start the engine. Control unit, pump control active Term. 20 to Term. 5.	max. 4 V	F 17
35	17	15	T3	Ignition off. Connect pressure gauge. Ignition on. Press T3. Take reading for fuel pressure.	2.3 ... 2.7 bar	F 19
36	17	15		Connect diagnosis cable and motortester. Connect CO-tester before catalytic converter. Disconnect tank vent hose. Have engine run. Check idle speed and CO	650 ... 750 min ⁻¹ 0.5 ... 0.8 vol. %CO	G 1
	17	15	T2	As above, values unchanged!		
37	17	15		Have engine run. Check timing at idle speed. Important! Idle speed must be between 650 and 750 min ⁻¹ or other timing angles will be obtained! If idle speed fluctuates, the timing also fluctuates.	3° ... 13° at idle speed	G 6
	17	15	T6	Check timing at full load. Set engine speed at 2700 min ⁻¹ press button T6 (full-load button). For testing, cool the engine with an auxiliary fan, because the timing is retarded as the air-intake temperature rises (starting from +30°C).	9° ... 15° at an engine speed 2700 min ⁻¹ and max. air-intake temperature +30°C.	G 6
38	17	15		Dwell angle at idle speed	6° ... 18°	G 8
				Dwell angle at 3000 min ⁻¹	22° ... 42°	
39	17	15	T5	Hold engine speed constant at 2000 min ⁻¹ . Press button T5. Fuel-injection signals discontinue, and return at approx. 1200 min ⁻¹ .	Engine "hunts"	G 10

A13

Rapid diag. chart for univ. test adapter
BMW 325e (USA)



A14

Rapid diag. chart for univ. test adapter
BMW 325e (USA)



Rapid diagnostic chart for the universal test adapter (continued) Control unit 0 261 200 021

Test step	Switch setting		But-ton	Notes	Test specifications (reading)	For trouble-shooting, see Coordinates
	V	Ω				
40/41	18/19	15		not used	-----	-----
42	20	22		Disconnect tank vent hose. Measure CO before the catalytic converter. Lambda closed-loop control "rich" stop, Term. 24 from control unit to ground	CO rises above 3.5 vol. %. After approx. 10 s, CO-level drops off again.	G 12
43	20	23		Measure CO before the catalytic converter. Lambda closed-loop control "lean" stop, Term. 24 from the control unit to + 2 V.	CO drops below 0.5 vol. %, engine runs rough. After approx. 10 s the CO-level rises again.	G 14
44	20	24		Measure CO before the catalytic converter. Lambda closed-loop control operation. Term. 24 from the control unit connected with the lambda sensor. After completion of the test, reconnect the tank vent hose	CO = <u>0.5 ... 0.8 vol. %</u>	G 16

A15

Rapid diag. chart for univ. test adapter
BMW 325e (USA)



A16

Rapid diag. chart for univ. test adapter
BMW 325e (USA)



2. TEST SPECIFICATIONS

C7

Idle speed

650 ... 750 min⁻¹

Exhaust gas setting
CO-level with engine
at normal operating
temperature:

0.5 ... 0.8 vol. %CO

Fuel pressure

2.3 ... 2.7 bar

Fuel pump delivery:

min. 750 cm³/30 s

For settings for ignition, valve clearance, and other engine data, see the Equipment and Autodata Microfiche.

Solenoid-operated fuel-
injection valve:

Internal electrical
resistance

2 ... 3 Ω

Air-flow sensor

Resistance between
Term. 7 and Term. 6.

8 Ω ... 2500 Ω

(Deflect air-flow sensor flap from at rest position to the full-load stop.)

Term. 9 and Term. 6:

500 Ω ... 1100 Ω

Idle actuator
(non-Bosch):

Internal electrical
resistance

9 ... 10 Ω

Lambda sensor

Resistance of the
heating coil:

approx. 6 ... 20 Ω

C5**A17**

Test specifications
BMW 325e (USA)



Temperature sensor I (NTC I, air):

Internal electrical resistance

at +15°C ... +30°C:

1.45 ... 3.3 kΩ

(measured on the air-flow
sensor between Term. 22 and
Term. 6)

At +80°C:

280 ... 360 Ω

Temperature sensor II (NTC II, coolant):

Internal electrical resistance

at +15°C ... +30°C):

1.3 ... 3.6 kΩ

at +80°C:

250 ... 390 Ω

Rotational-speed sensor and reference mark sensor

Internal electrical
resistance:

0.6 ... 1.6 kΩ

Throttle valve switch (microswitch)

Resistance of
idle contact (Term. 2
and Term. 43):

0 Ω

Full-load contact
(Term. 3 and Term. 43):

0 Ω

Start valve

Internal electrical
resistance

approx. 4 Ω

Thermotimeswitch

35° / 8 s:

Internal electrical resistance:

"G" and
ground

"W" and
ground

"G" and
"W"

Ambient temp-
erature (less than
+ 30°C):

25...40 Ω

0 Ω

25...40 Ω

engine at normal
operating temp-
erature (above
+40°C):

50...80 Ω

100...160 Ω

50...80 Ω

Pressure sensor (altitude sensor)

Total resistance between Term. 3
(+) and Term. 2 (-):

2.3...2.5 kΩ

Resistance between wiper
Term. 1 (S) and Term. 2(-)

0.4...2.3 kΩ

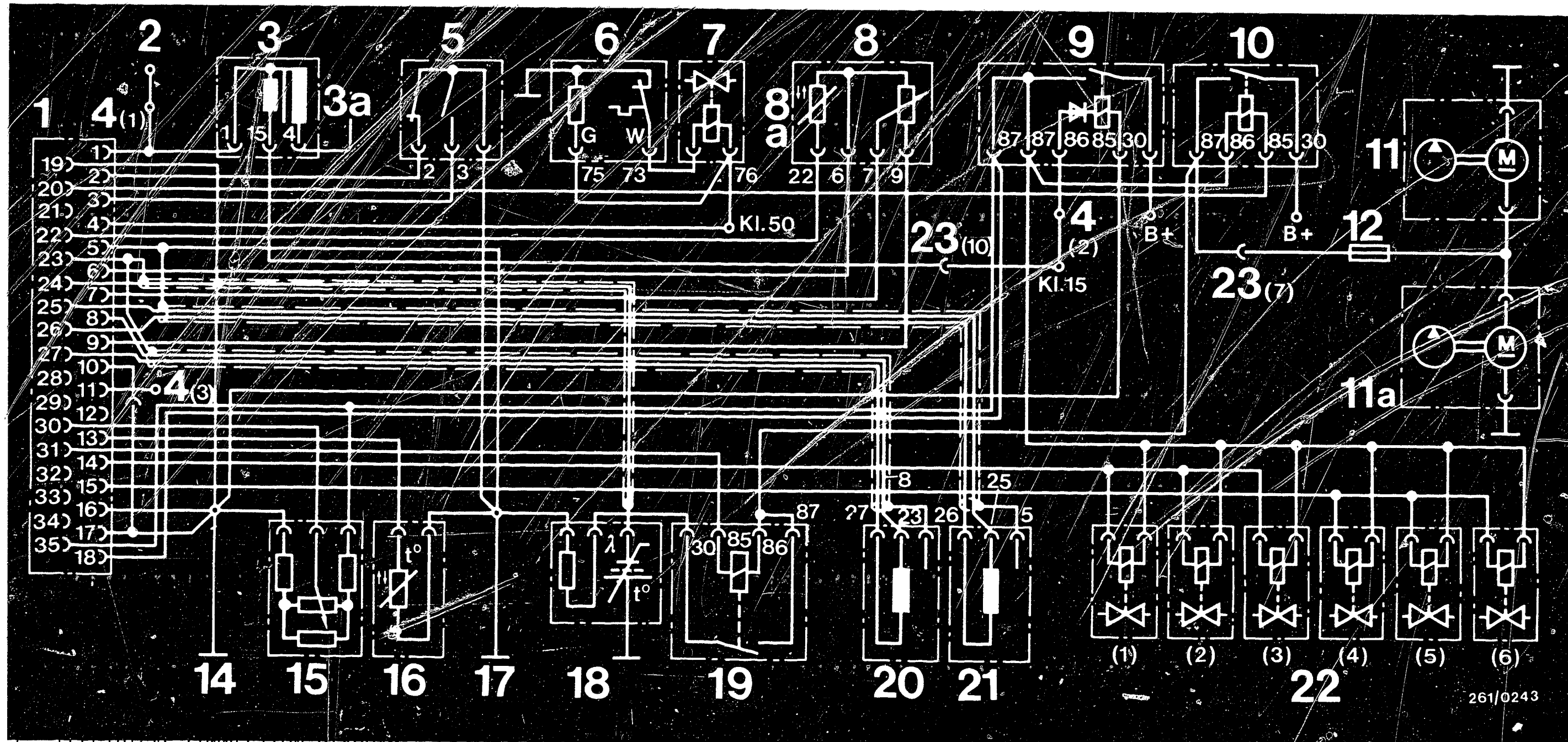
(dependent on altitude)

A18

Test specifications

BMW 325e (USA)





3. ELECTRICAL CONNECTION DIAGRAM

- 1 = Control unit plug
- 2 = to the diagnosis plug and tachometer
- 3 = Ignition coil
- 3a = to high-voltage distributor
- 4 = Plug connection (3-pole) in the glove compartment
- 5 = Throttle-valve switch
- 6 = Thermotime switch
- 7 = Start valve

- 8 = Air-flow sensor
- 8a = Temperature sensor I (air)
- 9 = Relay 2 (main relay with safety diode for incorrect polarity)
- 10 = Relay 1 (pump relay)
- 11 = Fuel pump
- 11a = Pre-supply pump
- 12 = Pump fuse F 11
- 14 = Vehicle ground for control unit output stage

- 15 = Altitude sensor
- 16 = Temperature sensor (coolant)
- 17 = Vehicle ground for control unit
- 18 = Lambda sensor (heated)
- 19 = Sensor heater relay
- 20 = Rotational-speed sensor
- 21 = Reference mark sensor
- 22 = Solenoid-operated fuel-injection valves
- 23 = Motor plug (No. 7, No. 10)

K1. = Term.

A19

Electrical connection diagram
BMW 325 e (USA)

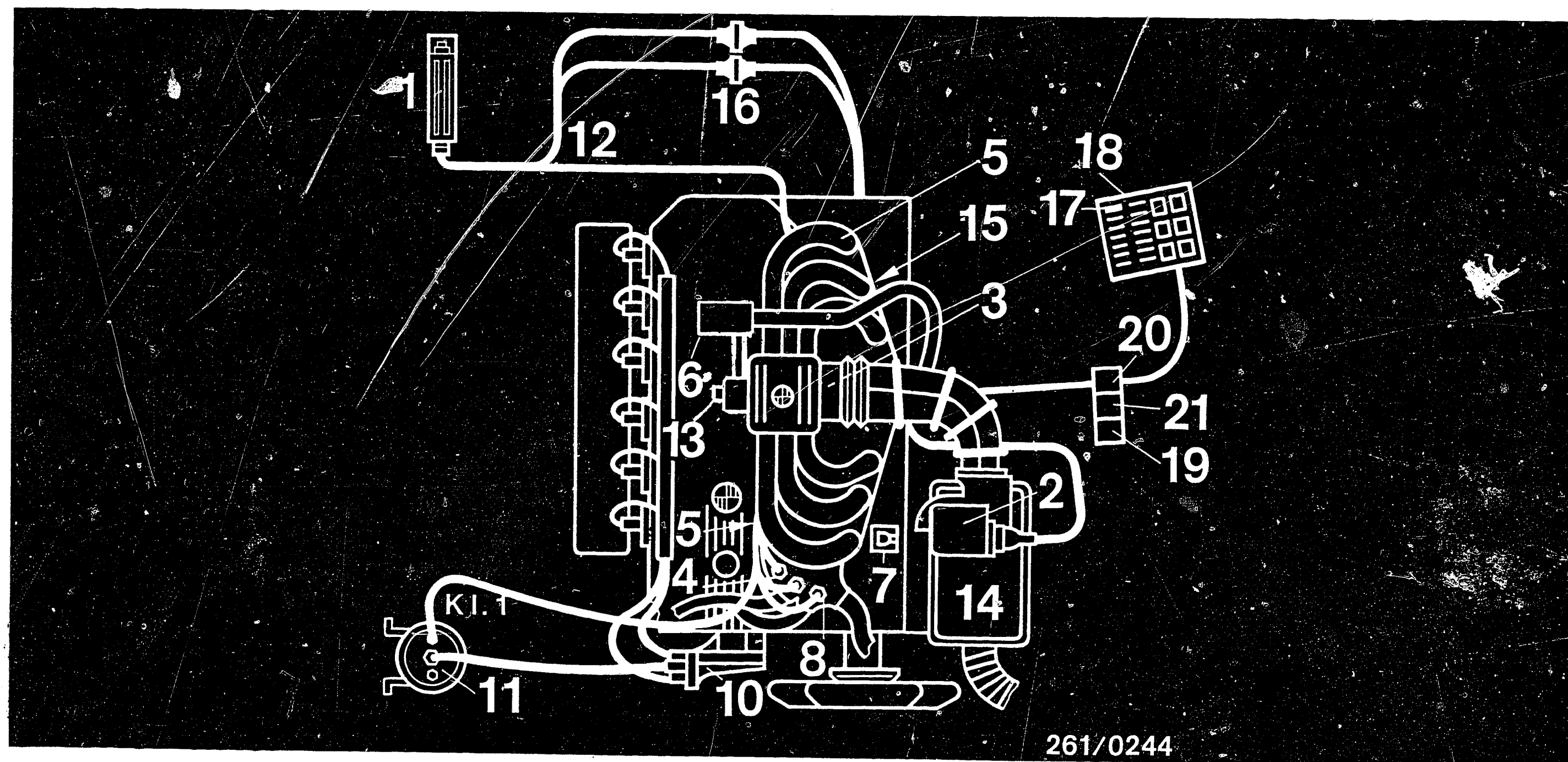


A20

Electrical connection diagram
BMW 325 e (USA)



261/0243



3.1 Diagram of electrical leads and arrangement of the Motronic components

- | | | |
|--------------------------------|---|-------------------------------|
| 1 = Control unit | 10 = High-voltage distributor | 17 = Pump fuse |
| 2 = Air-flow sensor | 11 = Ignition coil | 18 = Central electric box |
| 3 = Throttle-valve switch | 12 = Wiring harness | 19 = Relay 2 for control unit |
| 4 = Temperature sensor, engine | 13 = Start valve | 20 = Relay 1 for fuel pump |
| 5 = Fuel-injection valve | 14 = Air filter | 21 = Relay for sensor heater |
| 6 = Idle actuator | 15 = Central ground | |
| 7 = Diagnosis socket | 16 = Plug connections for rotational-speed and reference mark sensors | |
| 8 = Thermotime switch | | |

A21

Electrical lead diagram

BMW 325e (USA)

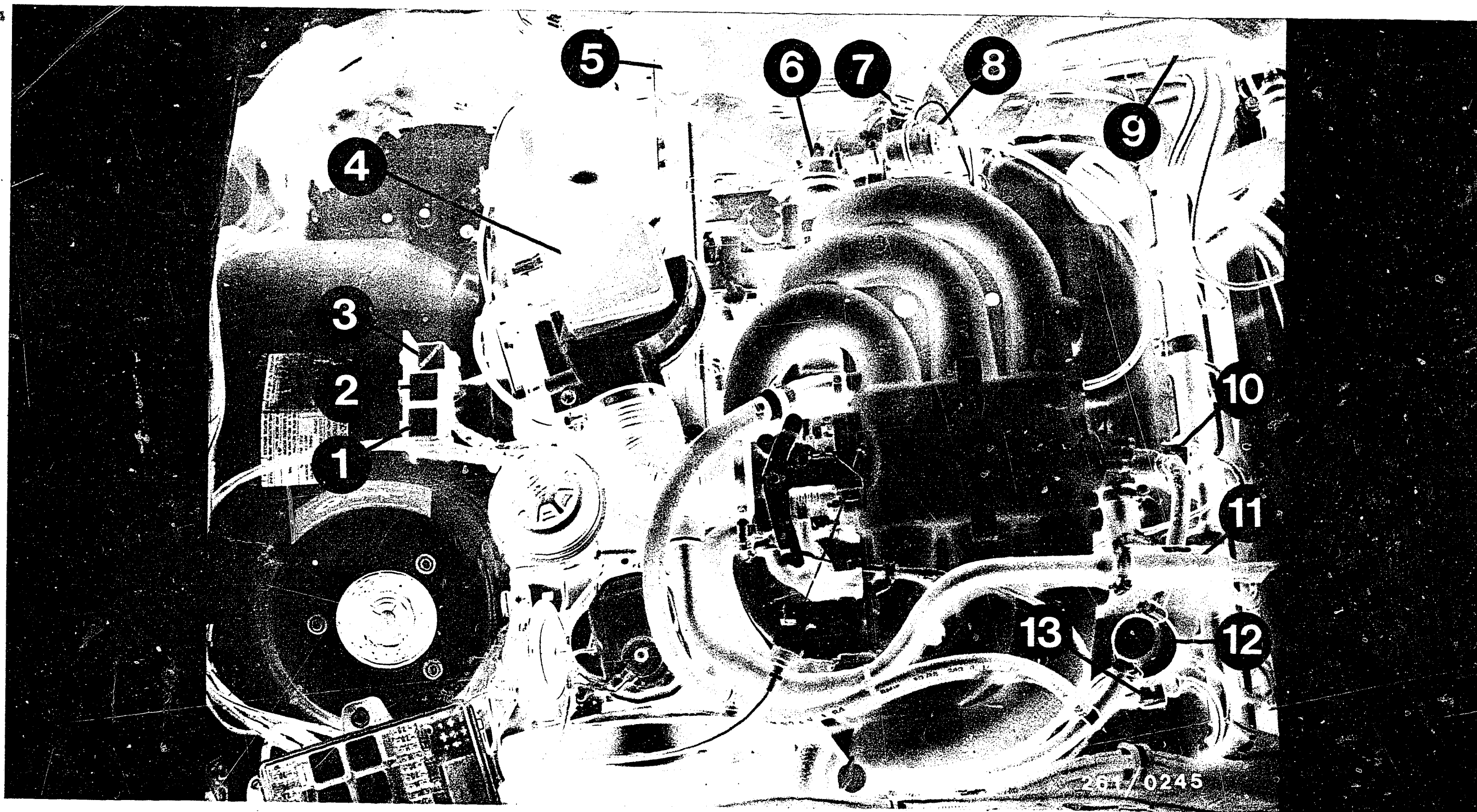


A22

Electrical lead diagram

BMW 325e (USA)





4. INSTALLATION POSITION OF THE COMPONENTS

- 1 = Pump relay
- 2 = Relay for sensor heater
- 3 = Main relay
- 4 = Air-flow sensor
- 5 = Altitude sensor (pressure sensor)

- 6 = Fuel-line-pressure damper
in the return
- 7 = Thermotime switch
- 8 = Pressure regulator
- 9 = High-voltage distributor

- 10 = Start valve
- 11 = Idle actuator
- 12 = Fuel-line-pressure damper
in the delivery line (not in the
standard model)
- 13 = Plug connection for the sensors

A23

Installation position of the components
BMW 325e (USA)



A24

Installation position of the components
BMW 325e (USA)

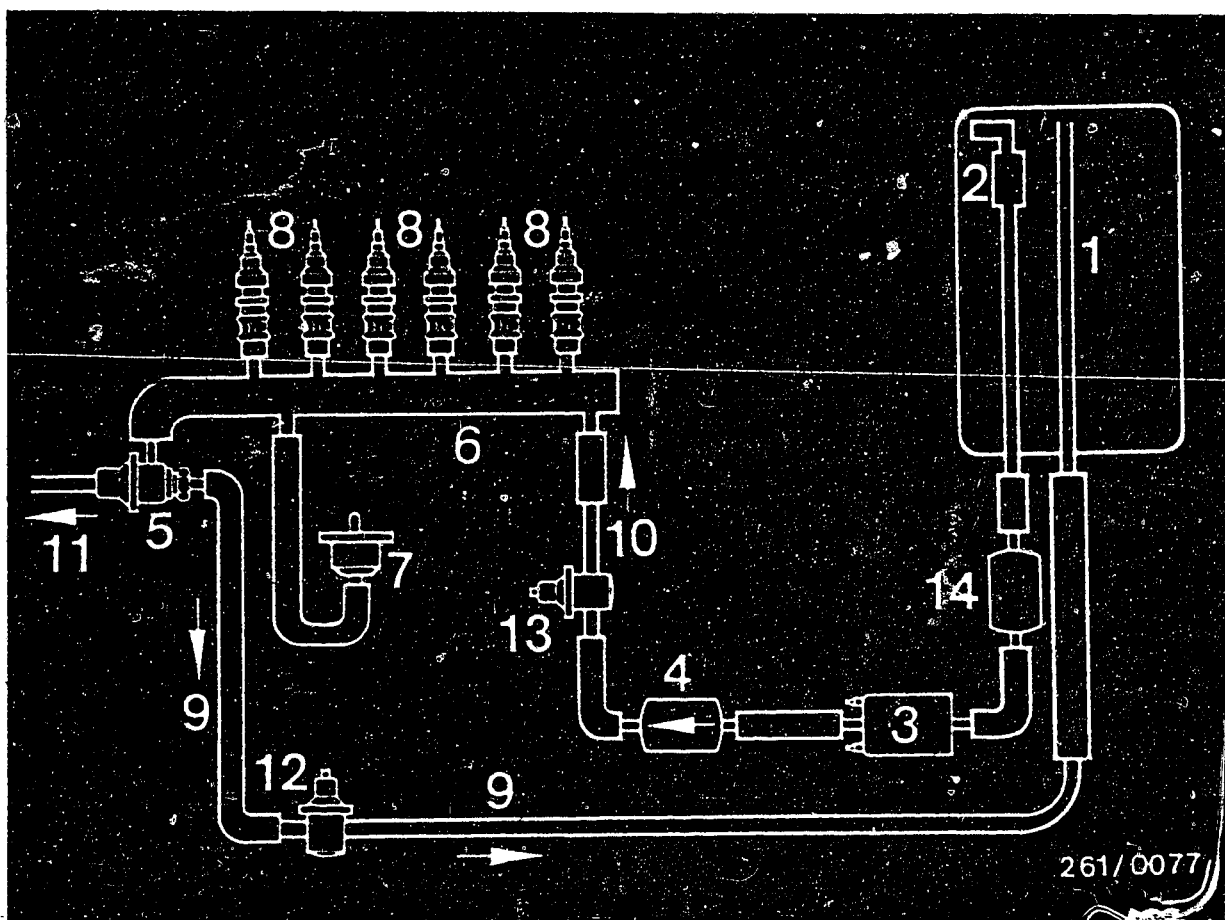


Installation position of the components (continued)

Indications for installation position are always based on the direction of forward vehicle travel. The list below is of those components that are not visible in the picture.

Reference mark and rotational-speed sensors:	In the starting motor ring gear housing on the circumference of the ring gear.
Fuel filter:	On the left in the engine compartment, near the bulkhead
Fuel pump:	On the left under the vehicle, near the fuel tank
Ground lead for the electric fuel pump:	On the left under the rear bench seat (well). Ground point on the vehicle body.
Control unit:	Behind the cover in the glove compartment.
Temperature sensor I (air):	In the air-flow sensor
Temperature sensor II (engine):	In front of the intake manifold, near the fan.
Central ground:	On the intake tube of the fifth cylinder





5. FUEL LINE DIAGRAM

- 1 = Fuel tank
 - 2 = Fuel pre-supply pump (in the tank)
 - 3 = Electric fuel pump
 - 4 = Fuel filter
 - 5 = Pressure regulator
 - 6 = Fuel distribution pipe
 - 7 = Start valve
 - 8 = Solenoid-operated fuel-injection valve
 - 9 = Fuel return line
 - 10 = Fuel delivery line
- Fuel delivery and return lines run on the underside of the vehicle, on the left.
- 11 = To the intake manifold
 - 12 = 1st fuel-line-pressure damper
 - 13 = 2nd fuel-line-pressure damper (not in the standard model)
 - 14 = Fuel spinner

6. TEST EQUIPMENT AND TOOLS

<u>Name</u>	<u>Designation</u>	<u>Part No.</u>
Universal test adapter Adapter lead, USA/Japan	ETT 018.01	0 684 101 801 1 684 463 128
Motortester	e.g. MOT 201	0 684 000 201
Diagnosis cable for measurement of timing angle		1 684 463 095
Exhaust gas tester	e.g. ETT 008.02 or ETT 008.03	0 684 100 802 0 684 100 803
Multimeter (min. internal resistance 20 k Ω /V)		commercially available e.g., Metra- watt GmbH Type MA2H or Fluke Multi- meter 75 or 77
Pressure gauge 6 bar or pressure tester or pressure tester (no longer available) Three-way line as connection for KDJE-P 100 and KDEP 1034	Quality class 1.0 Graduation 0.1 bar	1 687 231 154 KDJE-P 100 KDEP 1034 KDJE-P 100/13



<u>Name</u>	<u>Part Number</u>
Feeler gauge for measuring the sensor air gaps (up to 1 mm)	commercially available
Lubricant for rotational-speed and reference mark sensors	Molykote Longterm 2 commercially available
Chassis dynamometer, e.g. LPS 96 or LPS 002	0 680 017 001 0 680 100 200
Test lead 2-pole, for measuring resistances and signals, e.g., on fuel-inject- ion valves	1 684 463 093
Test leads for proper connection of test equip- ment to component plugs	KDZS 0004 (2.8 mm wide) KDZS 0005 (6.3 mm wide)

For USA/Japan:

Tool kit for removing and putting on the idle-CO anti-
tamper device for the air-flow sensor, e.g., No. 13
1090 from Cartool

Hans Schubert KG
Unterer Grasweg 88
D - 8070 Ingolstadt

or from BMW of America

Mounting paste VS 14016 Ft for the lambda sensor and the exhaust gas screw plug	5 960 080 105
Clamp to crimp off fuel and air hoses	commercially available



7. IMPORTANT GENERAL INSTRUCTIONS

Be absolutely certain to follow instructions in order to avoid damage to the engine, the control unit, or the ignition coil and to prevent endangering human life.

- Never start the engine unless the battery is firmly connected.
- Incorrect polarity or supply voltage, e.g., due to incorrect connection of the battery or ignition coil, can destroy the control unit.
- Do not use a quick charger to start the engine.

Provide starting assistance only with a second 12 V battery and a starting assistance cable.

Caution!

Due to differing requirements from vehicle manufacturers for electronic products, we recommend not using any batteries with 24 V for starting assistance. Follow the operating instructions for the vehicle.

- Separate the battery from the vehicle electrical system before quick charging.
- When charging the battery in the vehicle, or during starting assistance, follow instructions in the operator's handbook for the quick-charger and instructions from the vehicle manufacturer.
- Never disconnect the battery from the vehicle electrical system with the engine running.
- Do not short-circuit ignition coil Term. 1 to ground (e.g., to shut off the engine). The ignition coil and under some circumstances the control unit are destroyed.



- Never connect the positive terminal of the battery to ignition coil Term. 1. The control unit is destroyed.
- Never connect or disconnect the wiring harness plug of the control unit while the ignition is on.
- At temperatures above +80°C (paint-drying ovens), remove the control unit.
- During welding work (electrical spot welding), the control unit must be taken out.
- Disconnect relay set for compression pressure test. This prevents unwanted fuel injection from the fuel-injection valves.
- When installing an alarm system, follow the instructions in the installation instructions for Motronic vehicles or the after-sales service instruction SIS-All-500.
- In this connection, there must be assurance that the alarm relay is not subject to interference from outside fields (e.g. from ignition leads), causing false alarms.

C A U T I O N !



High energy
ignition system, dangerous
primary and secondary voltages!



The sticker shown means the following:

The Motronic contains a high energy ignition system which can be extremely hazardous if one touches parts or terminals that are live (both on the primary and on the secondary sides).

In this connection, we call your attention to the fact that when working or testing on the ignition system, the VDE regulations, particularly VDE 0104/7.67, are to be followed.

Basically, when working on the ignition coil, switch the ignition off. (Switch off the ignition or source of electricity.)

Such work includes, for example:

Connecting motortesters (timing strobe, a tact-dwell tester, an ignition oscilloscope, etc.).

Taking out and replacing parts of the ignition system (spark plug, ignition coil, high-voltage distributor, ignition cable, etc.).

If it is necessary to switch the ignition on (connect up the ignition or the source of electricity) during testing on the ignition system or during adjustment on the engine, then the dangerous voltages mentioned are present on the entire system.

That means, the risk of an accident is present not only at the individual components of the ignition system (such as, for example, the high-voltage distributor, the ignition coil, the control unit, and the ignition harness), but also on the wiring harness (such as, for example, the tachometer connection, the diagnosis plug), on plug connections, and on testing equipment.



8. TROUBLE SHOOTING

The purpose of the trouble-shooting programs below is to make it possible, when used in conjunction with the universal test adapter and other suitable test equipment, for the workshop employees to identify quickly the causes of defects on the Motronic. A selection can be made between the job procedures below, depending on the training and the experience of the mechanic.

- Detailed, step-by-step trouble-shooting
for employees with little experience and practice on vehicles with the Motronic
- Targeted trouble-shooting, leading directly to the cause of the defect
for trained and experienced employees with a fairly large amount of practice on vehicles with the Motronic.

C3

C5

Both trouble-shooting programs start with checking the electrical/electronic portion of the Motronic using the universal test adapter ETT 018.01. With this, the electrical function of the wiring harness and the components connected to it (including the control unit) are checked quickly and defects are quickly identified.

If no defect is found using the universal test adapter, it is necessary to continue with the detailed or the targeted trouble-shooting.

C1

Trouble-shooting
BMW 325e (USA)



C2

Trouble-shooting
BMW 325e(USA)



8.1 Detailed, step-by-step trouble-shooting

8.1.1 Testing with the universal test adapter

Be absolutely certain to start the testing program with this test, and to run this test from the start through to end.

8.1.2 Trouble-shooting according to customer complaints (defect symptoms)

The table below contains possible defect symptoms and, next to them in the column at the right, the initial coordinates for the pertinent detailed trouble-shooting program.

This program consists of test steps in a reasonable sequence for all individual components of the Motronic.

If the defect has not been identified and corrected after conclusion of the trouble-shooting program for an assumed defect symptom, a new defect symptom must be selected to determine a new program, and that program must be worked through.

<u>Customer complaints (defect symptoms)</u>		<u>Testing with universal test adapter</u>	<u>Coordinates</u>
1. Engine does not start or starts only with difficulty		C 11	G 19
2. Engine starts and then dies		C 11	H 17
3. Rough idle and/or incorrect idle speed		C 11	J 5
4. Poor throttle take-up		C 11	J 21
5. Engine missing in all driving conditions		C 11	K 13
6. Poor mileage		C 11	L 3
7. No max. engine power or max. velocity		C 11	L 17
8. CO-level too high or too low at idle		C 11	M 11
C3 Trouble-shooting BMW 325e (USA)		C4 Trouble-shooting BMW 325e (USA)	

8.2 Targeted trouble-shooting leading directly to the cause of the defect

8.2.1 Testing with the universal test adapter

Be absolutely certain to start the testing program with the test with the universal test adapter and run that test from the start through to end.

8.2.2. Trouble-shooting according to customer complaints

The table below contains various defect symptoms with several possible causes of defects in each instance. The cross-reference field indicates the initial coordinate for the test step on the pertinent individual component of the Motronic. If the defect has not been identified or corrected after completion of the test on the individual components, a new defect symptom must be determined.

Customer complaint (defect symptoms)

1. Engine does not start or starts only with difficulty								
2. Engine starts and then dies								
3. Rough idle, and/or incorrect idle speed								
4. Poor throttle take-up								
5. Engine missing in all driving conditions								
6. Poor mileage								
7. No max. engine power and/or max. velocity								
8. CO-level too high or too low at idle								
<u>Cause</u> (component defect)								
B11	B11	B11	B11	B11	B11	B11	B11	Testing with universal test adapter
●*)								Main or pump relay defective
●*)								Electric fuel pump defective
H3	K21	J11	K11					Idle speed control defective
		●*)				●*)		Throttle valve switch (idle and full-load contacts) defective
H13	J3	J7	K3	K17	L11	L21	M13	Air-flow sensor defective

Continued on C7/C8/C9/C10

C5

Trouble-shooting
BMW 325e (USA)



C6

Trouble-shooting
BMW 325e (USA)



Customer complaints (defect symptoms)

1. Engine does not start or starts only with difficulty
2. Engine starts and then dies
3. Rough idle, and/or incorrect idle speed
4. Poor throttle take-up
5. Engine missing in all driving conditions
6. Poor mileage
7. No max. engine power and /or max. velocity
8. CO-level too high or too low at idle

Cause (component defect)

H13	H19	J9	K5			M9	M17	Leaks in intake system
G 2		J15				L11	L21	Solenoid-operated fuel-injection valves defective
●*)		●*)				M5		Fuel pressure too low or zero, pressure regulator is not functioning
		●*)			●*)		●*)	Fuel pressure too high, pressure regulator is not functioning
				K19		M3		Fuel delivery too low
	●*)				●*)		●*)	Temperature sensor I (air) or temperature sensor II (coolant) defective
						L19		Throttle valve is not opening completely
				K15				Poor central ground, loose contacts, defective plug connections
H13	H19	J9	K5			M9	M17	Breaks in the wiring harness and plug connections
H5								Start valve is not opening
	H23	J13				L9	H15	Start valve is not closing
H11	J1	J13						Thermotime switch is defective
		J19				L15	M19	CO-exhaust setting too rich
		J19	●*)				M19	CO exhaust setting too lean
		●*)	●*)		●*)		●*)	Altitude sensor defective

C7

Trouble-shooting
BMW 325e (USA)



C8

Trouble-shooting
BMW 325e (USA)



Customer complaint (defect symptoms)

1. Engine does not start or starts only with difficulty								
2. Engine starts and then dies								
3. Rough idle, and/or incorrect idle speed								
4. Poor throttle take-up								
5. Engine missing in all driving conditions								
6. Poor mileage								
7. No max. engine power and/or max. velocity								
8. CO-level too high or too low at idle								
Cause (component defect)								
●*)								Rotational-speed sensor defective
●*)								Reference mark sensor defective
			L1					Check alternator, interference suppression devices
G21		J7	J23	K15	L7	L19	M13	Check secondary patterns
●*)	●*)	●*)	●*)	●*)	●*)	●*)	●*)	Control unit defective
		●*)					●*)	Check lambda closed-loop control

●*) You have already checked these components if you have carried out the test with the universal test adapter.
Continue the testing with the next component in this column.
If however, you have reached this point via a complaint about a component or the table of test specifications, you must check this component with the universal test adapter.
The testing program for the test adapter begins at Coordinates C 11, and is to be run completely.

9. TESTING WITH THE UNIVERSAL TEST ADAPTER ETT 018.01
(0 684 101 801) and the adapter lead for the Motronic
(1 684 463 128)

Connect the universal test adapter to the Motronic wiring harness. (The ignition must be switched on.)

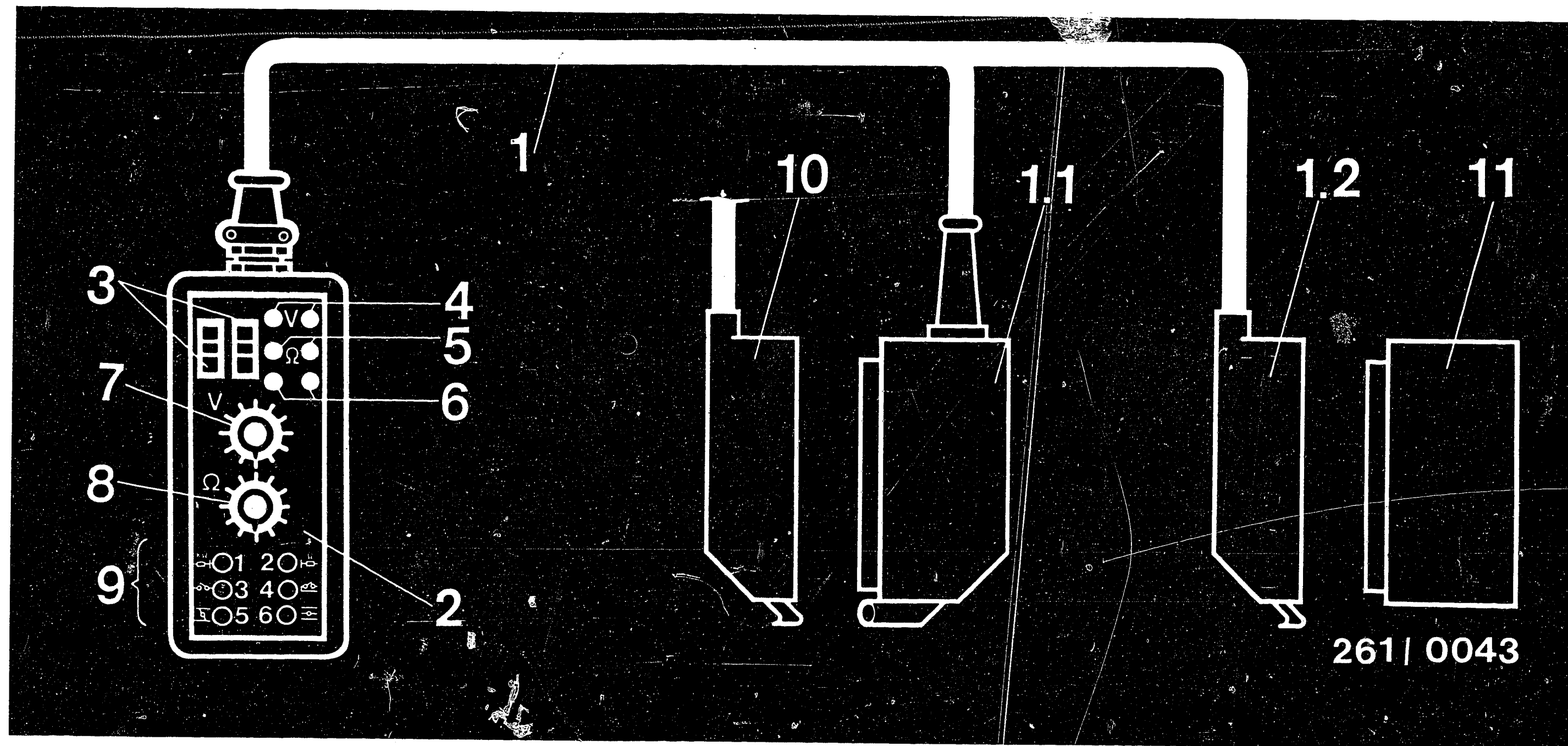
To test the wiring harness and the components connected to it, it is permissible to connect only the Motronic wiring harness, but not the control unit. Be absolutely certain to follow the instructions in the test chart.

A tester for measurement of voltage and resistance (multimeter) and a motortester are to be connected to the test adapter for taking measurements.

The individual test steps are selected using the program switch. The symbols "V" and " Ω " indicate to the operator whether voltage or resistance is being measured. Several switch settings are also required for simulation while the engine is running. By activating the buttons, with the control unit connected and the engine running, operating conditions can be changed, i.e. simulated, as desired. Thus, for example, when the engine is at normal operating temperature, an engine temperature of -20°C can be simulated for the control unit by pressing button T 1, and the reaction of the control unit can be evaluated on the motortester.

If necessary, the wiring diagram can be used for troubleshooting.





Universal test adapter with adapter lead for Motronic

- 1 = Adapter lead
- 1.1 = Connection to the wiring harness
- 1.2 = Connection to the control unit
- 2 = Universal test adapter (Part No. 0 684 001 801)
- 3 = Test wells (for motortester)
- 4 = Test sockets (for measuring voltage)
- 5 = Test sockets (for measuring resistance)
- 6 = Test sockets (not assigned)
- 7 = Program switch "V"
- 8 = Program switch "Ω"

- 9 = Buttons to simulate operating conditions
- Button 1 = NTC II (engine), cold (-20°C)
- Button 2 = NTC II (engine), warm ($+80^{\circ}\text{C}$)
- Button 3 = Triggering of pump
- Button 4 = Not assigned
- Button 5 = Throttle valve, idle contact
- Button 6 = Throttle valve, full-load contact
- 10 = Motronic wiring harness
- 11 = Control unit

C12

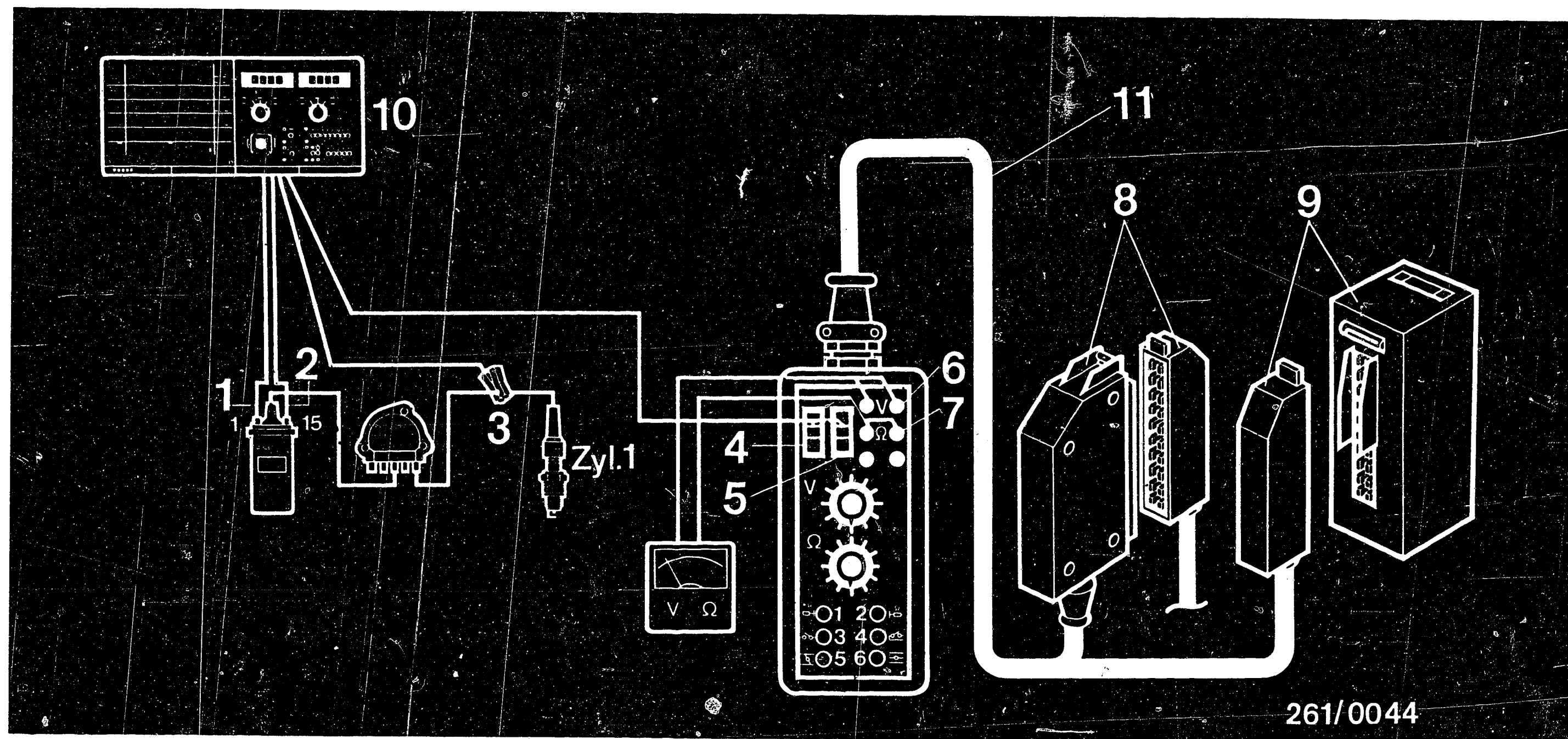
Testing with universal test adapter
BMW 325e (USA)



C13

Testing with universal test adapter
BMW 325e (USA)





261/0044

Connection diagram for universal test adapter

- 1 = Green clip to ignition coil Term. 1
- 2 = Yellow clip to ignition coil Term. 15
- 3 = Clamp-on induction pick-up over the ignition cable of cylinder 1
- 4 = Red connection socket (test well) for the red terminal of the motortester
- 5 = Black connection socket (test well) for the black terminal of the motortester

- 6 = Connection of the voltmeter to V-sockets (red = +, black = ground or -)
- 7 = Connection of the ohmmeter to Ω sockets (blue)
- 8 = Connection to the Motronic wiring harness
- 9 = Connection to the Motronic control unit
- 10 = Motortester
- 11 = Adapter lead for Motronic

C14

Testing with universal test adapter
BMW 325e (USA)



C15

Testing with universal test adapter
BMW 325e (USA)



Preparation for testing with the universal test adapter

Take out the control unit and connect the test adapter.

Installation position of the control unit: Behind the cover in the glove compartment.

To take it out, the detent must be pressed back and the plug must be flipped up in the direction shown by the arrow and disconnected.

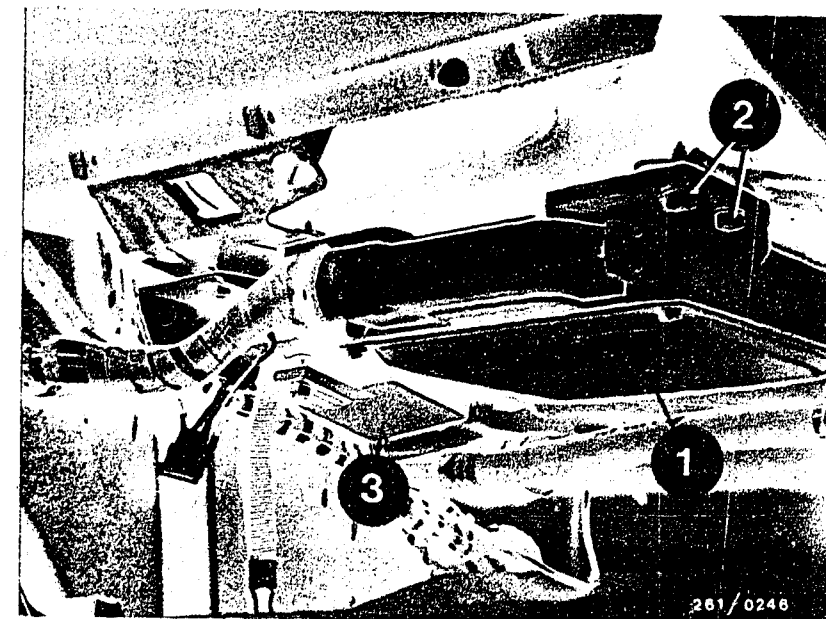
The control unit is fastened with 4 screws.

Note

In order to preclude confusing the control unit for the various systems one for the other, a mechanical encoding system has been introduced. The "lug" (pivot point when connecting and disconnecting the control unit) and the corresponding receptacle on the control unit have recesses or pins that fit one another.

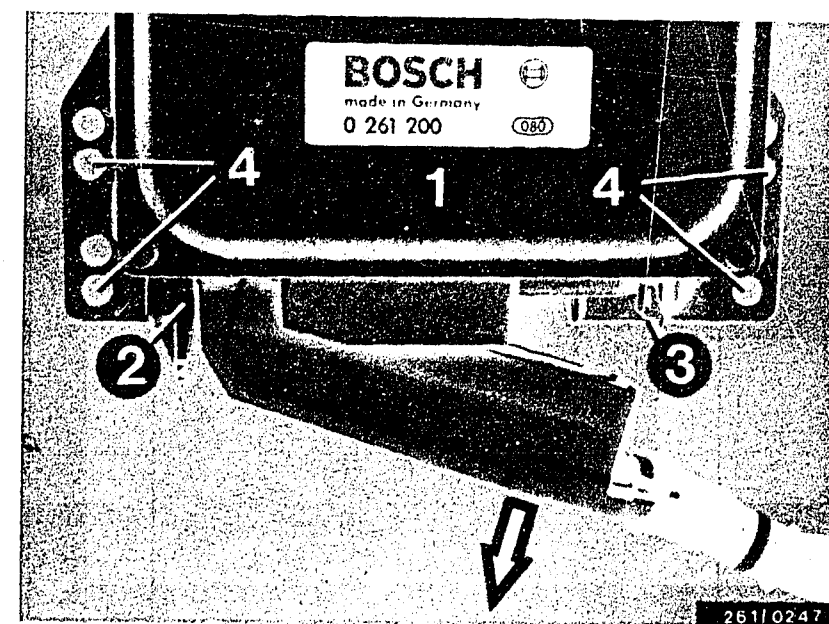
Note:

In the test steps that follow, a white border in the column "operation" indicates what operation is to be changed from the preceding test step.



- 1 = Control unit for Motronic
- 2 = Fastening screws
- 3 = Control unit for idle speed control

- 1 = Control unit
- 2 = Lug
- 3 = Plug detent
- 4 = Fastening holes



C16


Testing with universal test adapter
BMW 325e (USA)

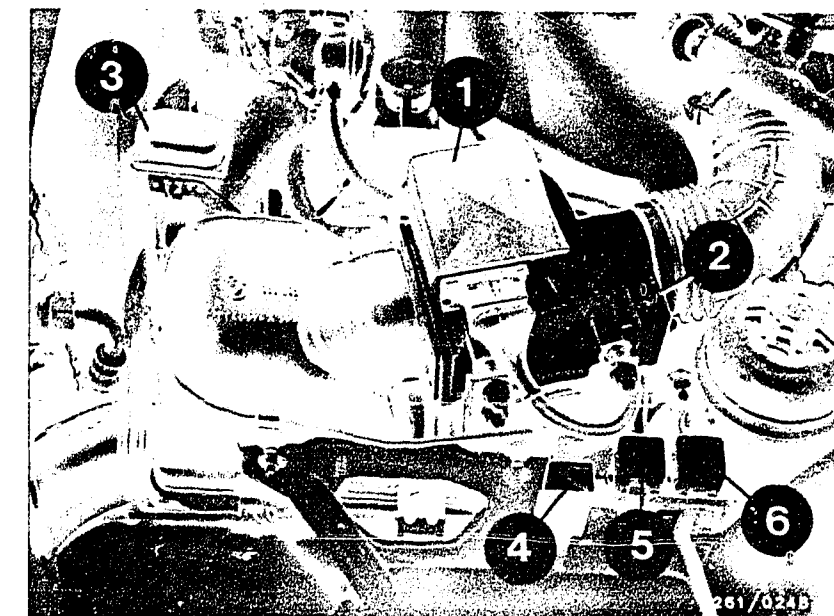


C17

Testing with universal test adapter
BMW 325e (USA)



TEST STEP 1: Switch off ignition. Disconnect control unit and pump relay.		
Operation:	Reading	Testing
Program switch "V" in setting: 	Resistance must be greater than 1 M Ω	Component: Rotational-speed sensor
Program-switch " Ω " in setting: 1		
Test equipment: Ohmmeter	<div>yes</div> <div>Continue testing with next test step.</div> <div>no</div>	Operation: Insulation from Term. 8 to ground
Scale: 10 M Ω		Malfunction: Resistance less than 1 M Ω
Connection: Test sockets Ω		
Operation in vehicle: Switch off ignition		



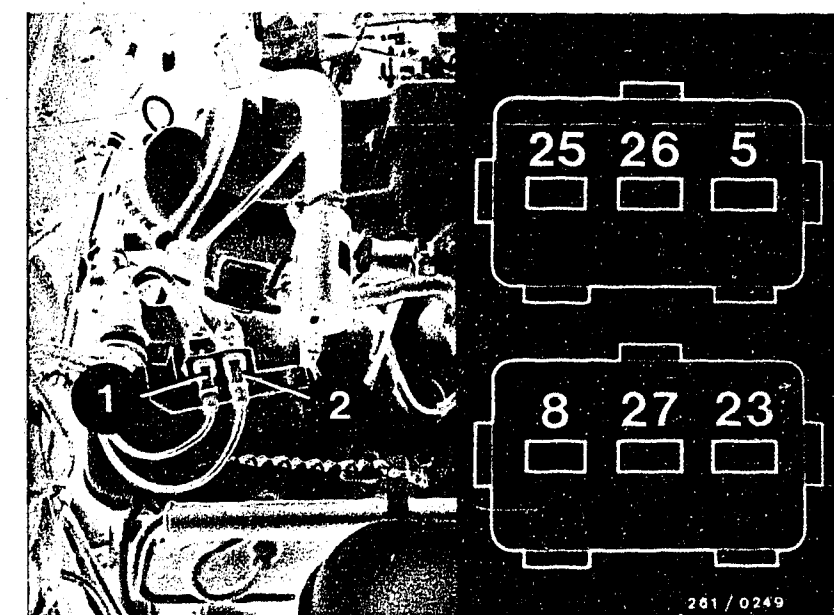
4 = Relay 2 (main relay)
5 = Relay for sensor heater
6 = Relay 1 (pump relay)

1 = Plug connection for reference mark sensor with gray plug
2 = Plug connection for rotational-speed sensor with black plug

Trouble-shooting:

Check plug connection for corrosion and damage to insulation. Take apart the plug connection and on the plug that leads to the test adapter, jump terminals 8 and 27 with a wire. Repeat the test: If the reading is now O.K., take out and replace the rotational-speed sensor. If the reading still is less than the specified value, the leads from the control unit plug Term. 8 or Term. 27 to the plug have damaged insulation (e.g., ground connection due to wear).

Continued on C20/C21



C18

Testing with universal test adapter
BMW 325e (USA)



C19

Testing with universal test adapter
BMW 325e (USA)



Trouble-shooting, TEST STEP 1 (continued)

● Replace the sensor.

To take out and replace the sensors, unscrew the socket hex screw on the sensor. Remove dirt deposits on the sensor. If necessary, insert two screwdrivers into the recesses at the left and the right of the sensor and lift the sensor.

Before putting the sensor in, make certain that no metal parts cling to it. (The sensors contain permanent magnets.) Grease the sensors with Molykote Longterm 2.

Do not confuse the sensors one for the other on installation!

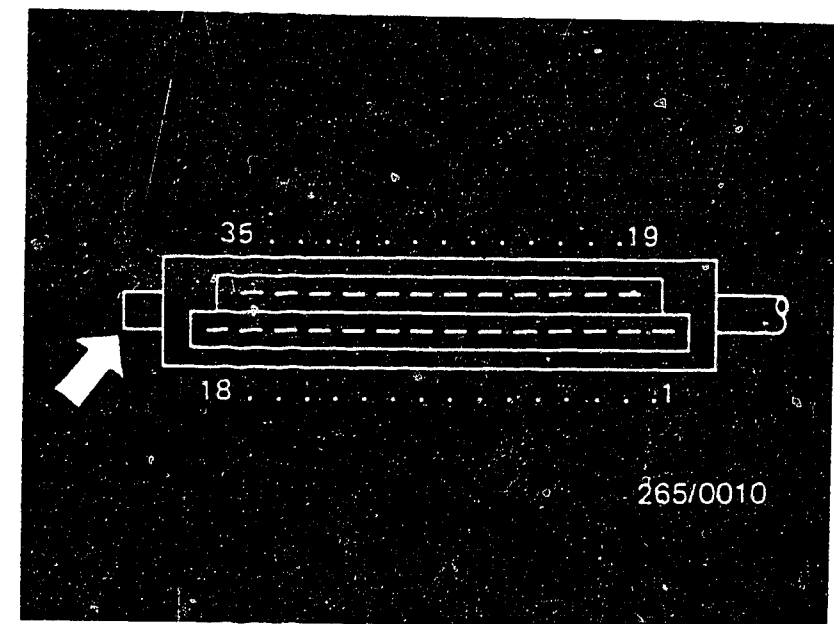
Watch the identification marking:

The reference mark sensor is identified with a cable binder.

The sensors are inserted into the hole down to the stop, and screwed tight. Do not use any force when putting them in.

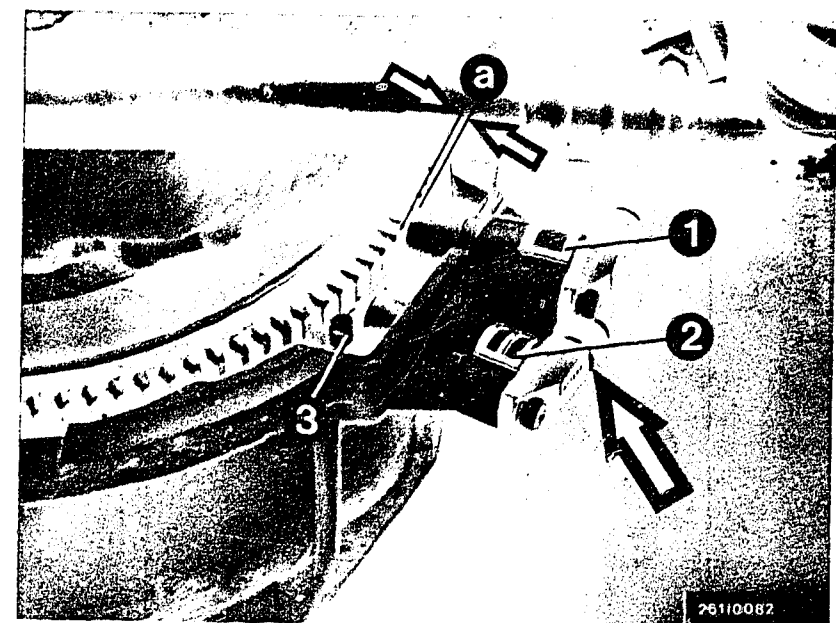
On assembly, make certain that the couplings are correctly assigned!

Make certain that there is a proper seating and latching of the spring contacts in the plug! It must not be possible to shove the spring contacts back!



Top view of the control unit plug (35-pole), with terminal numbers.
Arrow = "lug" with mechanical coding.

- 1=Rotational-speed sensor (D)
- 2=Reference mark sensor (B)
- 3=Reference mark
- a=Air gap
- Arrow = Identification marking for reference mark sensor



C20

Testing with universal test adapter
BMW 325e (USA)

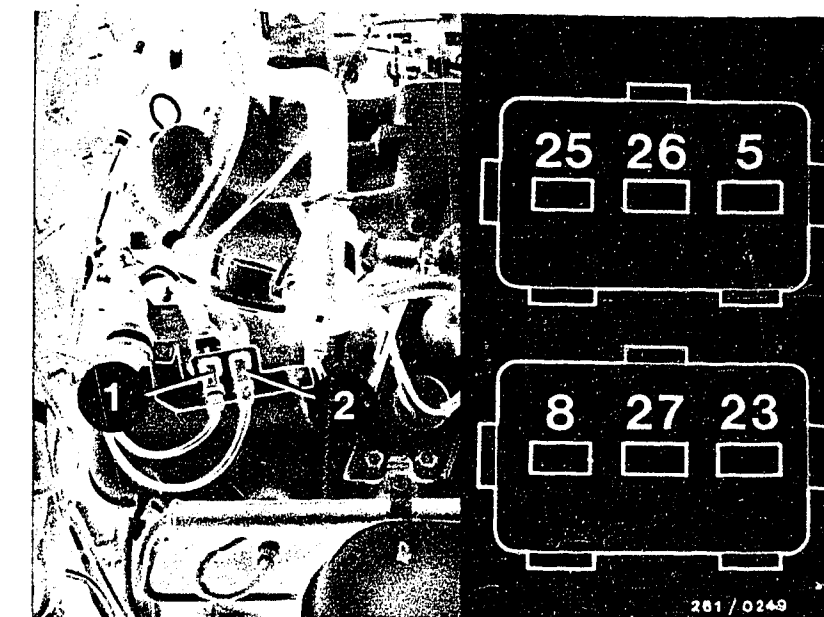


C21

Testing with universal test adapter
BMW 325e (USA)



TEST STEP 2:			
Operation		Reading	Testing
Program switch "V" in setting:	↓	Resistance must be greater than 1 M Ω	Component: Reference mark sensor
Program switch " Ω " in setting:	2		
Test equipment: Ohmmeter		<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> yes ↓ Continue testing with next test step. </div> <div style="text-align: center;"> no ↓ </div> </div>	Operation: Insulation from Term. 25 to ground
Scale: 10 M Ω			Malfunction: Resistance less than 1 M Ω
Connection: Test sockets	Ω		
Operation in vehicle: Switch off ignition.			



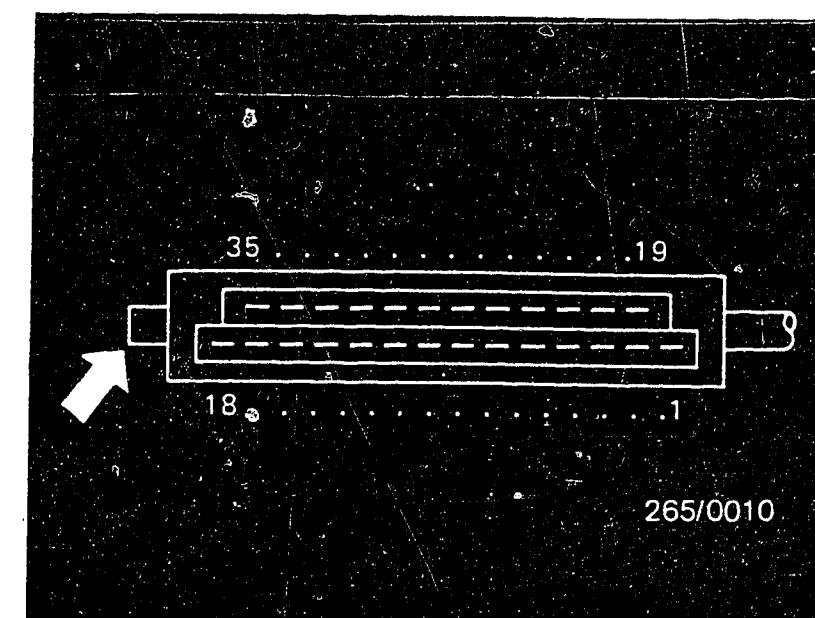
- 1 = Plug connection for reference mark sensor, with gray plug
 2 = Plug connection for rotational-speed sensor, with black plug

Top view of control unit plug (35-pole) with terminal numbers.
 Arrow = "Lug" with mechanical coding

Trouble-shooting:

Check plug connection for corrosion and damage to insulation. Take apart the connection and on the plug that leads to the test adapter, jump terminals 25 and 26 with a wire. Repeat the test: If the reading is now O.K., take out and replace the rotational-speed sensor. If the reading is still less than the specified value, the leads from the control unit plug Term. 25 or Term. 26 to the plug have damaged insulation (e.g., ground short due to wear).

Continued on D1/D2.



C22

Testing with universal test adapter
 BMW 325e (USA)



C23

Testing with universal test adapter
 BMW 325e (USA)



Trouble-shooting TEST STEP 2 (continued)

- Replace the sensor.

To take out and replace the sensor, unscrew the socket hex screw on the sensor. Remove dirt deposits on the sensor. If necessary, insert two screwdrivers into the recesses at the left and the right of the sensor and lift the sensor.

Before putting the sensor in, make certain that no metal parts cling to it. (The sensors contain permanent magnets.) Grease the sensors with Molykote Longterm 2.

Do not confuse the sensors one for the other on installation!

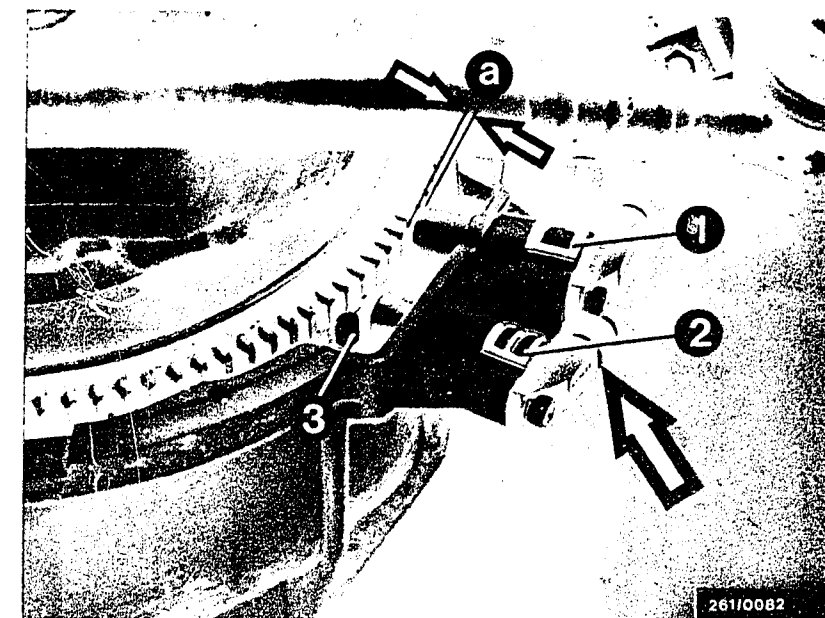
Watch the identification marking:

The reference mark sensor is identified with a cable binder.

The sensors are inserted into the hole down to the stop, and screwed tight. Do not use any force when putting them in.

On assembly, make certain that the couplings are correctly assigned!

Make certain that there is a proper seating and latching of the spring contacts in the plug! It must not be possible to shove the spring contacts back!



- 1 = Rotational-speed sensor (D)
- 2 = Reference mark sensor (B)
- 3 = Reference mark
- a = air gap
- Arrow = Identification marking for reference mark sensor

D1

Testing with universal test adapter
BMW 325e (USA)

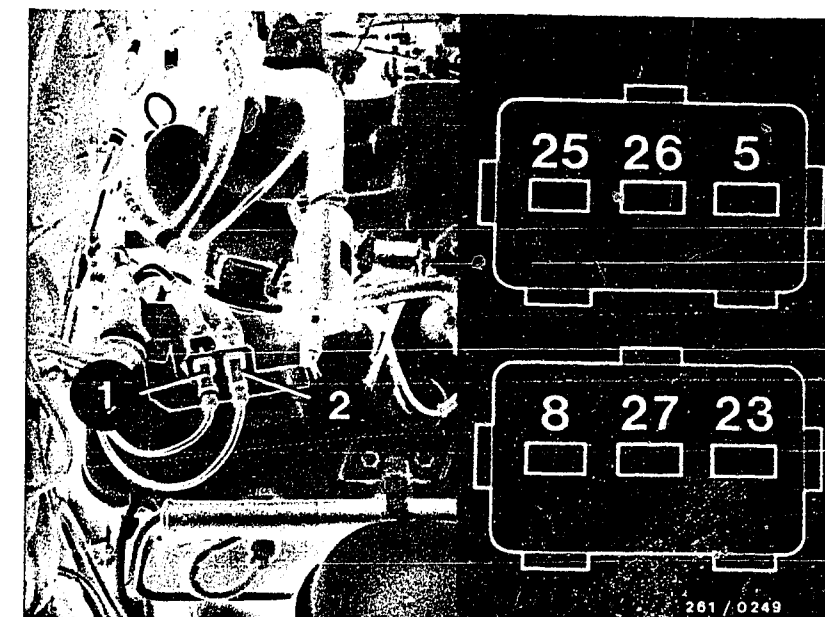


D2

Testing with universal test adapter
BMW 325e (USA)

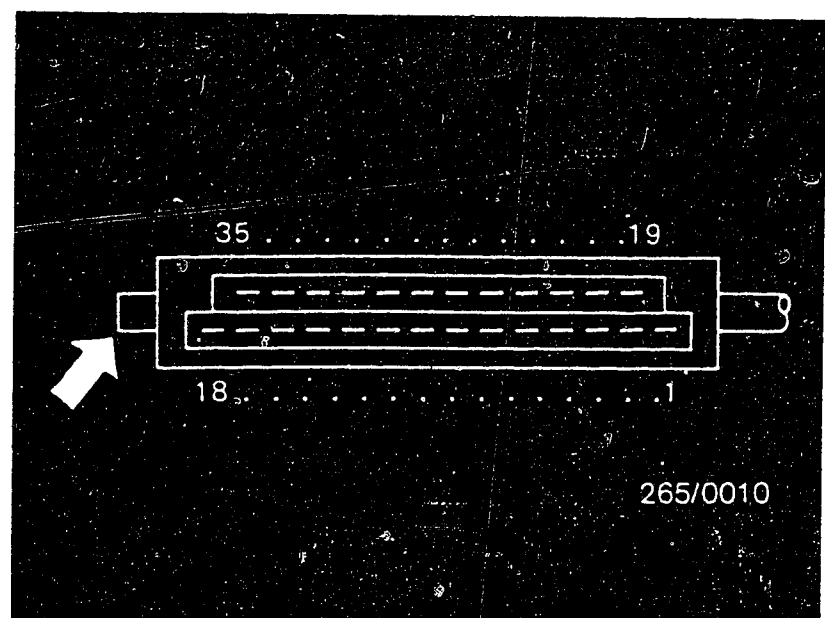


TEST STEP 3:		
Operation	Reading	Testing
Program switch "V" in setting:	↓ Ohmmeter must read 0.6 ... 1.6 kΩ	Component: Rotational-speed sensor
Program switch "Ω" in setting:	3	
Test equipment: Ohmmeter	<div> <div>yes</div> <div>no</div> </div>	Operation: Coil resistance between Term. 8 and Term. 27 Malfunction: Resistance not within tolerance
Scale: 0 to 10 kΩ		
Connection: Test sockets		
Operation in vehicle: Switch off ignition	<div> <div>Continue testing with next test step.</div> </div>	



- 1 = Plug connection for reference mark sensor, with gray plug
2 = Plug connection for rotational speed sensor, with black plug

Top view of control unit plug (35-pole), with terminal numbers.
Arrow = "Lug" with mechanical coding.



Trouble-shooting:

- Repeat the measurement directly on the sensor plug.
- Check the plug connection: Corrosion, loose contact, (it must not be possible to shove the spring contacts back!)
- Check the leads from the rotational-speed sensor Term. 8 and Term. 27 to the control unit plug Term. 8 and Term. 27.
- Take out and replace the sensor.

To take out and replace the sensor, unscrew the socket hex screw on the sensor. Remove dirt deposits on the sensor. If necessary, insert two screwdrivers into the recesses at the left and the right of the sensor and lift the sensor.

Continued on D5/D6

D3

Testing with universal test adapter
BMW 325e (USA)



D4

Testing with universal test adapter
BMW 325e (USA)



Trouble-shooting TEST STEP 3 (continued)

Before putting the sensor in, make certain that no metal parts cling to it. (The sensors contain permanent magnets.) Grease the sensors with Molykote Longterm 2.

Do not confuse the sensors one for the other on installation!

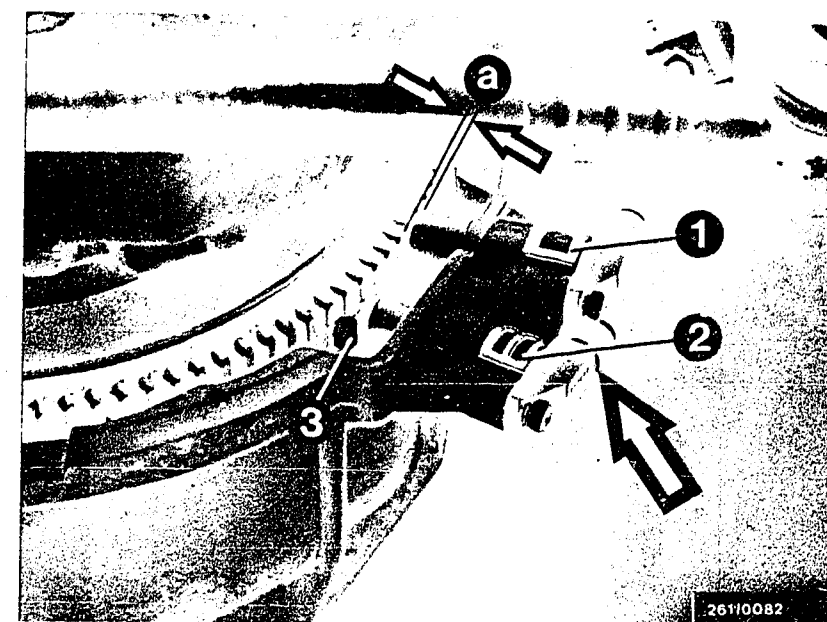
Watch the identification marking:

The reference mark sensor is identified with a cable binder.

The sensors are inserted into the hole down to the stop, and screwed tight. Do not use any force when putting them in.

On assembly, make certain that the couplings are correctly assigned!

Make certain that there is a proper seating and latching of the spring contacts in the plug! It must not be possible to shove the spring contacts back!



- 1 = Rotational-speed sensor (D)
- 2 = Reference mark sensor (B)
- 3 = Reference mark
- a = Air gap
- Arrow = Identification marking for reference mark sensor

D5


Testing with universal test adapter
BMW 325e (USA)



D6

Testing with universal test adapter
BMW 325e (USA)



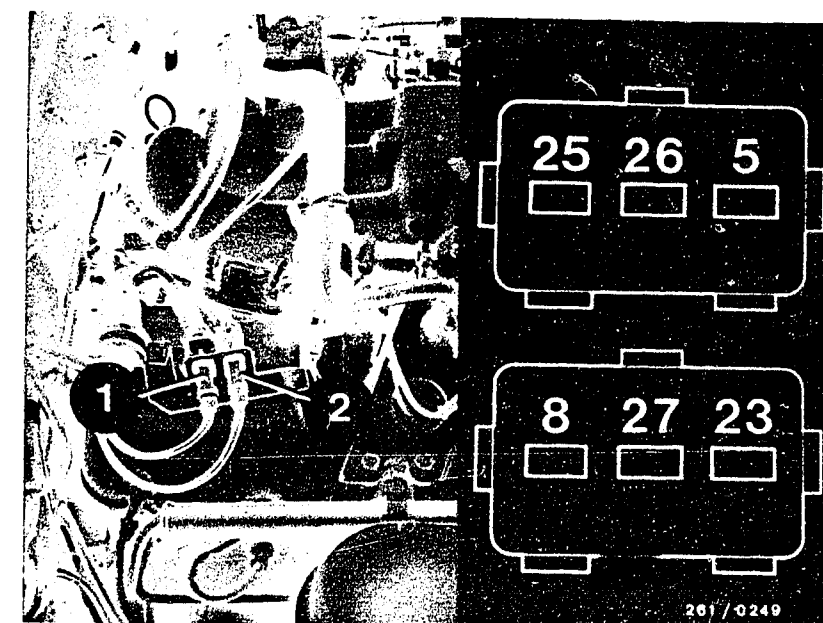
TEST STEP 4:		
Operation	Reading	Testing
Program switch "V" in setting: 	Ohmmeter must read <u>0.6 ... 1.6 kΩ</u>	Component: Reference mark sensor
Program switch "Ω" in setting: 4		
Test equipment: Ohmmeter	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> yes ↓ Continue testing with next test step. </div> <div style="text-align: center;"> no ↓ </div> </div>	Operation: Coil resistance between Term. 25 and Term. 26 Malfunction: Resistance not within tolerance
Scale: 0 to 10 kΩ		
Connection: Test sockets Ω		
Operation in vehicle: Switch off ignition.		

Trouble-shooting:

- Repeat the measurement directly on the sensor plug.
- Check the plug connection: Corrosion, loose contact, (it must not be possible to shove the spring contacts back!)
- Check the leads from the reference-speed sensor Term. 25 and Term. 26 to the control unit plug Term. 25 and Term. 26.
- Take out and replace the sensor.

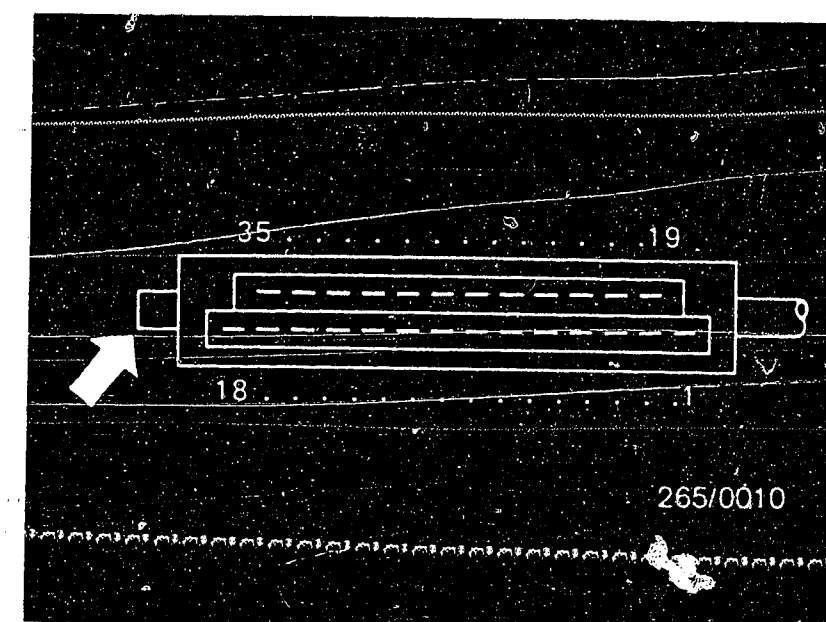
To take out and replace the sensor, unscrew the socket hex screw on the sensor. Remove dirt deposits on the sensor. If necessary, insert two screwdrivers into the recesses at the left and the right of the sensor and lift the sensor.

Continued on D9/D10



- 1 = Plug connection for reference mark sensor, with gray plug
- 2 = Plug connection for rotational speed sensor, with black plug

Top view of control unit plug (35-pole), with terminal numbers.
Arrow = "Lug" with mechanical coding.



D7

Testing with universal test adapter
BMW 325e (USA)



D8

Testing with universal test adapter
BMW 325e (USA)



Trouble-shooting TEST STEP 4 (continued)

Before putting the sensor, make certain that no metal parts cling to it. (The sensors contain permanent magnets.) Grease the sensors with Molykote Longterm.

Do not confuse the sensors one for the other on installation!

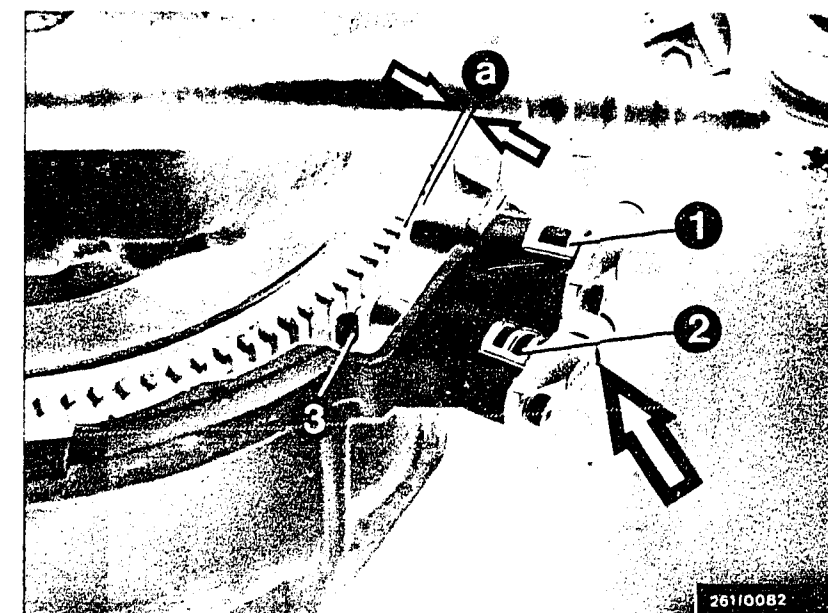
Watch the identification marking:

The reference mark sensor is identified with a cable binder.

The sensors are inserted into the hole down to the stop, and screwed tight. Do not use any force when putting them in.

On assembly, make certain that the couplings are correctly assigned!

Make certain that there is a proper seating and latching of the spring contacts in the plug! It must not be possible to shove the spring contacts back!



1 = Rotational-speed sensor (D)

2 = Reference mark sensor (B)

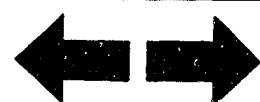
3 = Reference mark

a = Air gap

Arrow = Identification marking for reference mark sensor

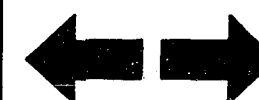
D9


Testing with universal test adapter
BMW 325e (USA)

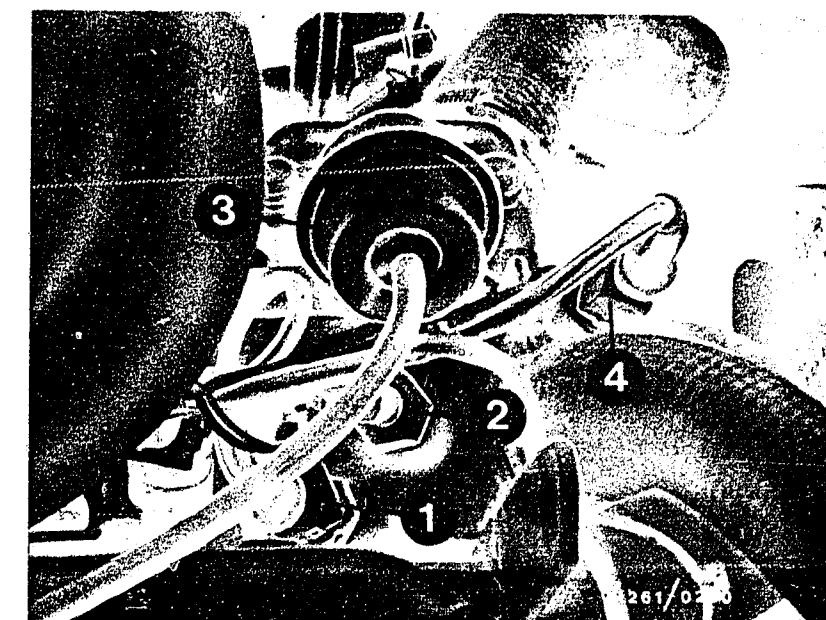


D10

Testing with universal test adapter
BMW 325e (USA)



TEST STEP 5:			
Operation		Reading	Testing
<u>Program switch "V"</u> in setting:		Measurement depends on temperature, i.e., watch the engine temperature. At ambient temperature (+15°C...+30°C): <u>1.3...3.6 kΩ</u>	Component: Temperature sensor engine (NTC II)
<u>Program switch "Ω"</u> in setting:	5		
<u>Test equipment:</u> Ohmmeter		With engine at normal operating temperature (approx. +80°C): <u>250...390 Ω</u>	Operation: <u>Resistance</u> between Term. 13 and ground
<u>Scale:</u> 0 to 10 kΩ			
<u>Connection:</u> Test sockets	Ω	<div>yes</div> <div>Continue testing with <u>next test step.</u></div>	Malfunction: <u>Resistance</u> not within tolerance. Watch the temperature!
<u>Operation in vehicle:</u> Switch off ignition		<div>no</div>	



- 1 = Temperature sensor, engine (NTC II)
- 2 = Remote thermometer sensor
- 3 = Pressure regulator
- 4 = Thermotime switch

Trouble-shooting:

- Disconnect the plug on the temperature sensor and measure the resistance directly. If need be, take out and replace the temperature sensor.
- Check the leads from the temperature sensor to the control unit plug Term. 13 and to the ground terminal.
- Eliminate contact resistances in the plug connections. It must not be possible to shove the spring contacts back!

D11


Testing with universal test adapter
BMW 325e (USA)

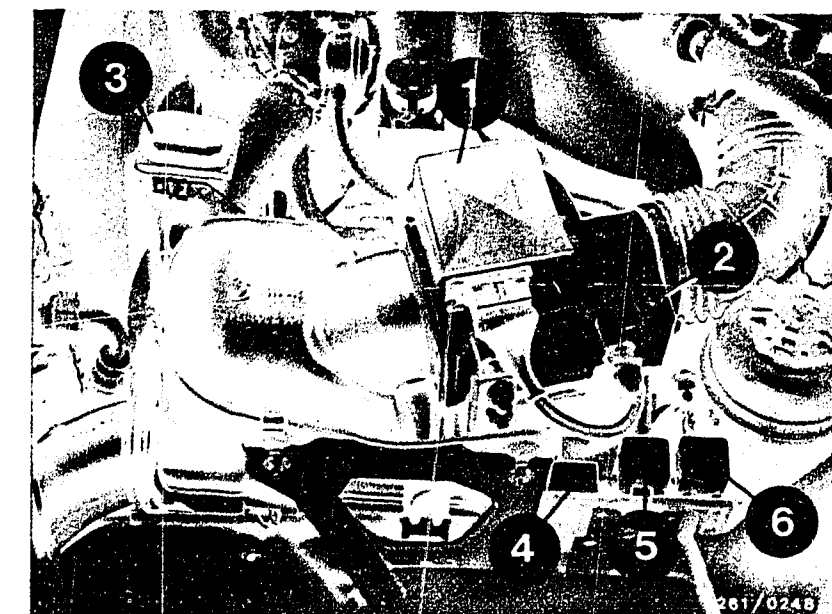


D12

Testing with universal test adapter
BMW 325e (USA)



TEST STEP 6:			
Operation		Reading	Testing
Program switch "V" in setting:		Measurement depends on temperature, i.e., watch air temperature in the intake channel. At ambient temperature (+15°C...+30°C) 1.45 ... 3.3 kΩ	Component: Temperature sensor, air (NTC I)
Program switch "Ω" in setting:	6		
Test equipment: Ohmmeter		With engine at normal operating temperature (approx. +80°C): 280 ... 360 Ω	Operation: Resistance between Term. 22 and ground
Scale: 0 to 10 kΩ			
Connection: Test sockets	Ω	<div><div>yes ↓ Continue testing with next test step.</div><div>no ↓</div></div>	Malfunction: Resistance not within tolerance. Watch the temperature!
Operation in vehicle: Switch off ignition			

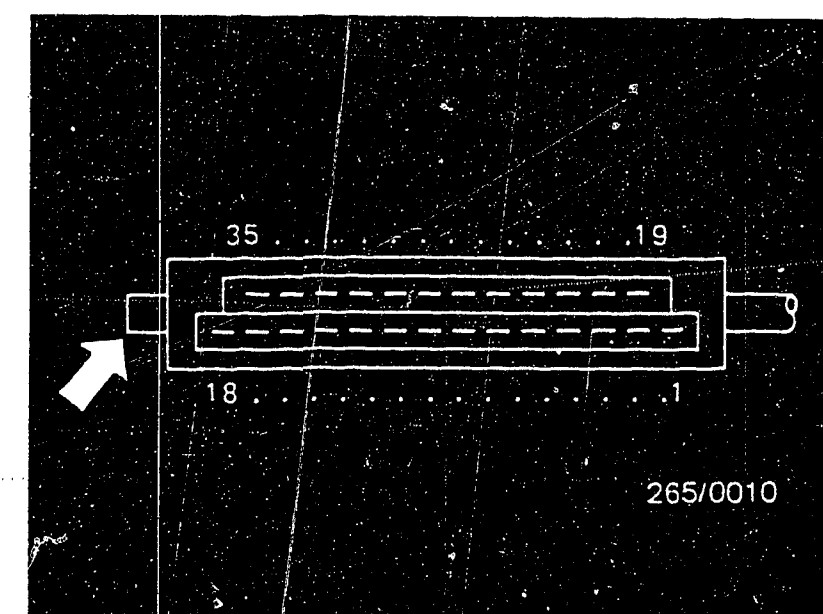


1 = Air-flow sensor with NTC I
2 = Idle-mixture-adjusting screw

Top view of control unit plug (35-pole), with terminal numbers.
Arrow = "Lug" with mechanical coding.

Trouble-shooting:

- Disconnect plug at the air-flow sensor and measure resistance directly at Term. 22 and Term. 6.
If the measurement is not within tolerance, take out and replace the air-flow sensor.
- Leads from the air-flow sensor Term. 6 and Term. 22 to the control unit plug Term. 6 and Term. 22.
- Eliminate contact resistances in the plug connections.
It must not be possible to shove the spring contacts back!



D13

Testing with universal test adapter
BMW 325e (USA)



D14

Testing with universal test adapter
BMW 325e (USA)



TEST STEP 7:

Operation

Reading

Testing

Program switch "V"
in setting:



less than 10 Ω

Component:

Lead for map switch

Program switch " Ω "
in setting:

7

Test equipment:
Ohmmeter

yes

no

Scale:
0 to 10 k Ω

Continue testing
with test step
9.
(Test step 8 is
not used)

Operation:

Connection between Term. 10
and ground

Connection:
Test sockets

Ω

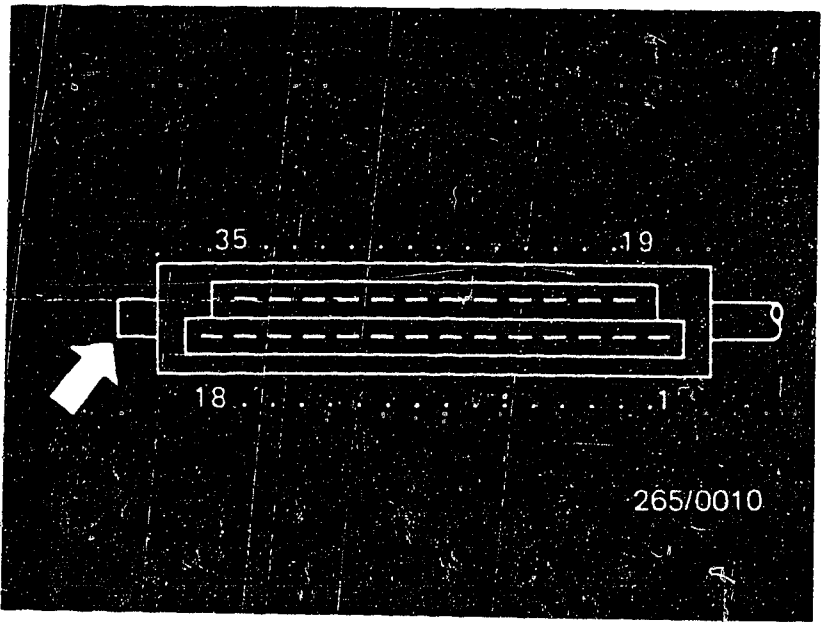
Malfunction:

Resistance greater than 10 Ω

Operation in vehicle:
Switch ignition off

Trouble-shooting:

- Make connection from the multiple plug Term. 10 to ground.



Top view of control unit plug (35-pole), with terminal numbers.
Arrow = "Lug" with mechanical coding.

D 15

Testing with universal test adapter
BMW 325e (USA)

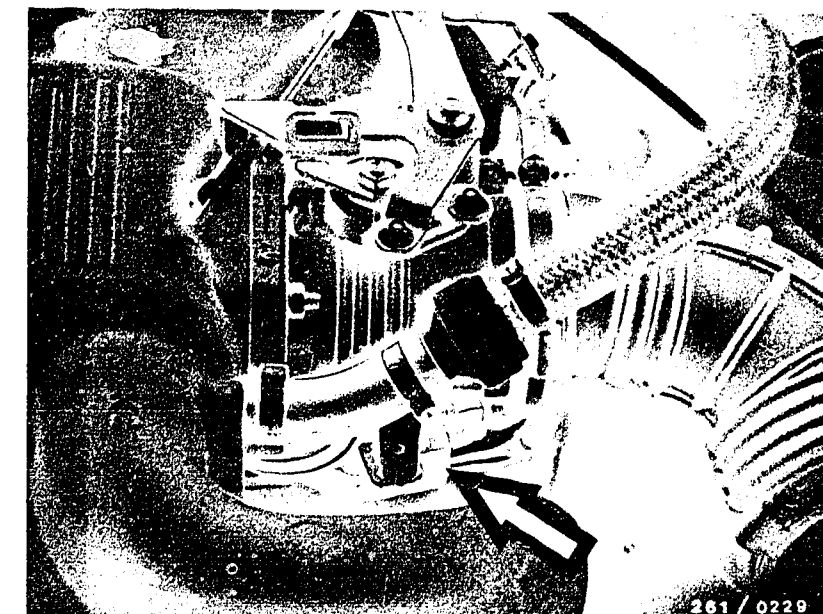


D 16

Testing with universal test adapter
BMW 325e (USA)



TEST STEP 9: (Test step 8 is not used)		
Operation:		Reading:
Program switch "V" in setting:	↓	Accelerator pedal in at rest position: less than 10 Ω
Program switch " Ω " in setting:	9	(Measurement is affected by the resistor in the adapter.)
Test equipment: Ohmmeter		Step down on the accelerator. (Part load range): $\infty \Omega$ 1)
Scale: 0 to 10 k Ω		
Connection: Test sockets	Ω	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> yes ↓ Continue testing with next test step. </div> <div style="text-align: center;"> no ↓ </div> </div>
Operation in vehicle: Switch ignition off		
		Component: Throttle valve switch Operation: Idle contact between Terminal 2 and ground Malfunction: Resistance in at rest position greater than 10 Ω or less than $\infty \Omega$.



Arrow = Throttle valve switch

Trouble-shooting:

1) Adjusting the throttle valve switch:

Undo the fastening screws. Turn the control lever to full throttle and slowly move it back to the idle stop. Continue turning the switch in a clockwise direction until the contact switches perceptibly (reading less than 10 Ω). Tighten screws.

Continued on D19/D20

D17

Testing with universal test adapter
BMW 325e (USA)



D18

Testing with universal test adapter
BMW 325e (USA)



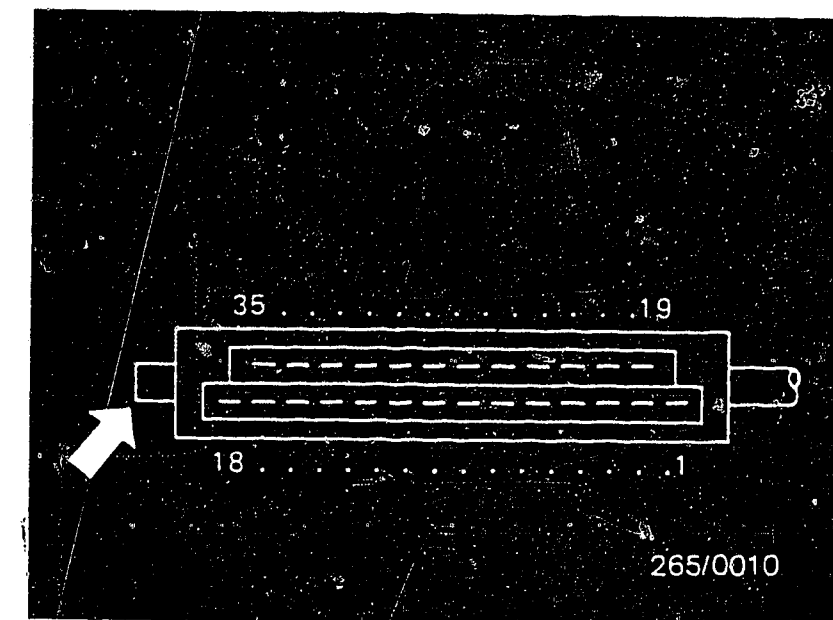
Trouble-shooting, throttle valve switch (continued)

Checking: Slowly open the accelerator pedal in the direction of full load. After being moved a short distance, the reading must shift to ∞ .

If no adjustment is possible:

Check the throttle valve switch (idle contact) and the leads from the throttle valve switch to the control unit plug Term. 2 and to the ground terminal.
Eliminate contact resistances.

It must not be possible to shove spring contacts back!



Top view of control unit plug (35-pole), with terminal numbers.
Arrow = "Lug" with mechanical coding.

D 19

Testing with universal test adapter
BMW 325e (USA)



D 20

Testing with universal test adapter
BMW 325e (USA)



TEST STEP 10		
Operation		Reading
Program switch "V" in position	↓	Accelerator pedal in part load setting:
Program switch "Ω" in position	10	∞Ω
Test equipment: Ohmmeter		Acceleration pedal at full-load stop
Scale 0 to 10 kΩ		less than 10 Ω 1)
Connection: Test sockets	Ω	(Measurement is affected by the resistor in the adapter)
Operation in vehicle: Switch off ignition		yes
		no
		Continue testing with next test step.

Trouble-shooting:

- 1) Checking: Move the throttle valve in the direction of full load. Shortly before the full-load stop for the control lever, the reading shifts to values less than 10 Ω. (Full-load contact closed).

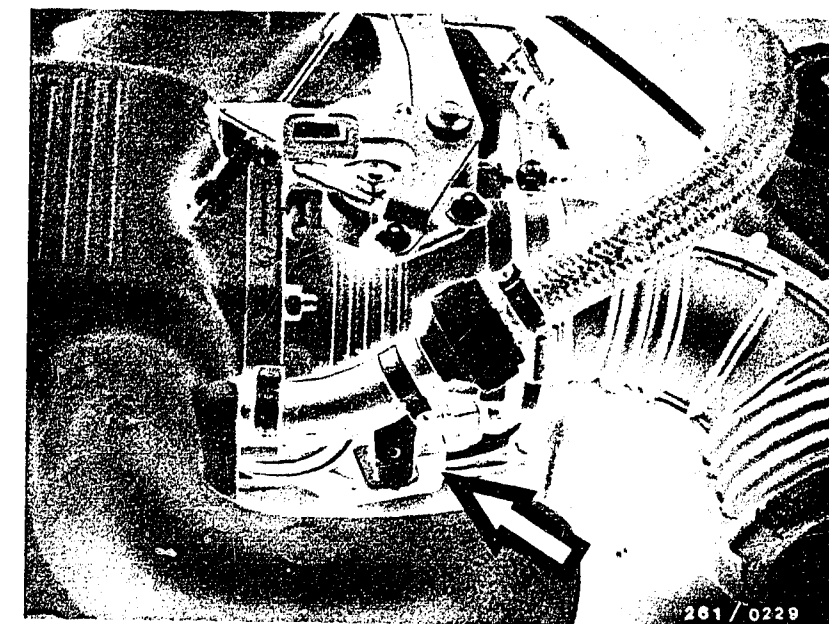
Reading greater than 10 Ω or ∞Ω:

Check whether the throttle valve opens completely. Check the bowden cable from the accelerator pedal to the throttle valve.

Check the throttle-valve switch and the lead from the throttle-valve switch Term. 3 to the control unit plug Term. 3.

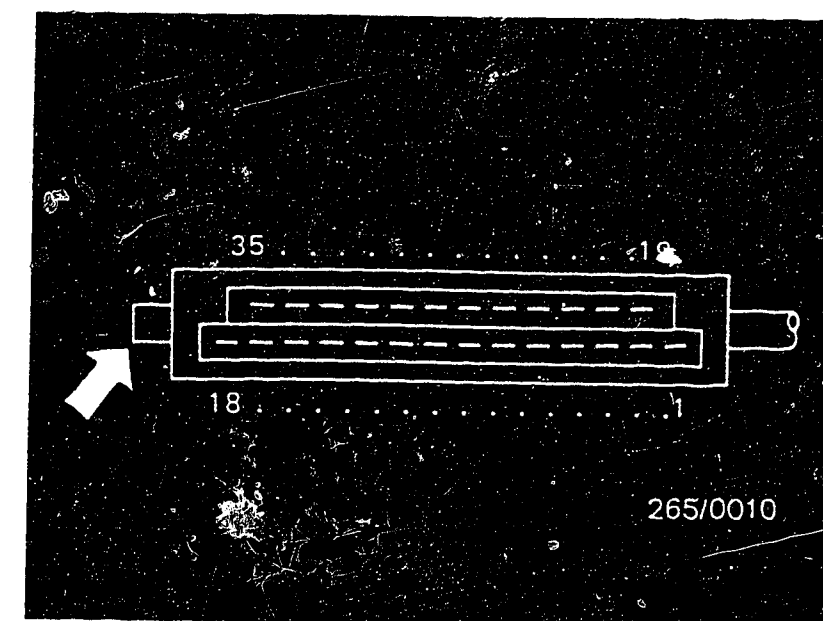
Eliminate contact resistances.

It must not be possible to shove spring contacts back!



Arrow = Throttle valve switch

Top view of control unit plug (35-pole) with terminal numbers.
Arrow = "Lug" with mechanical coding.



D21

Testing with universal test adapter
BMW 325e (USA)



D22

Testing with universal test adapter
BMW 325e (USA)



TEST STEP 11			
Operation		Reading	Testing
Program switch "V" in setting:	↓	Ohmmeter must read less than 10 Ω (Measurement is affected by the resistor in the adapter)	Component: Ground Lead
Program switch " Ω " in setting:	11		
Test equipment Ohmmeter		<div>yes</div> <div>↓</div> <div>Continue testing with next test step</div>	Operation: Contact resistance between Term. 16 and ground Malfunction: Resistance greater than 10 Ω
Scale: 0 to 10 k Ω			
Connection: Test sockets	Ω		
Operation in vehicle: Switch off ignition		no	

Trouble-shooting:

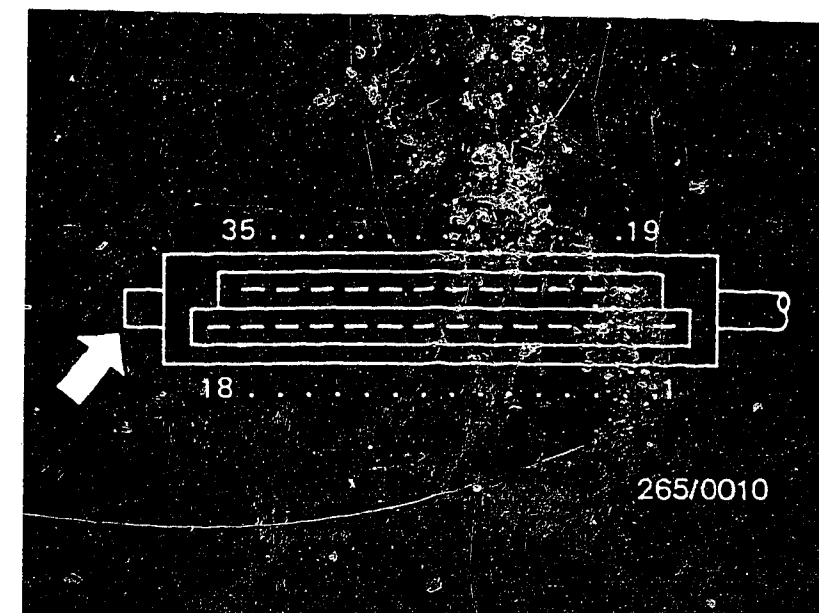
To test, disconnect the wiring harness plug from the test adapter and, if necessary, use a wiring diagram.

Check the following leads for continuity using an ohmmeter (specified value approx. 0 Ω):

- From the control unit plug Term. 16 to the ground terminal.
- From the control unit plug Term. 5 to the ground terminal.

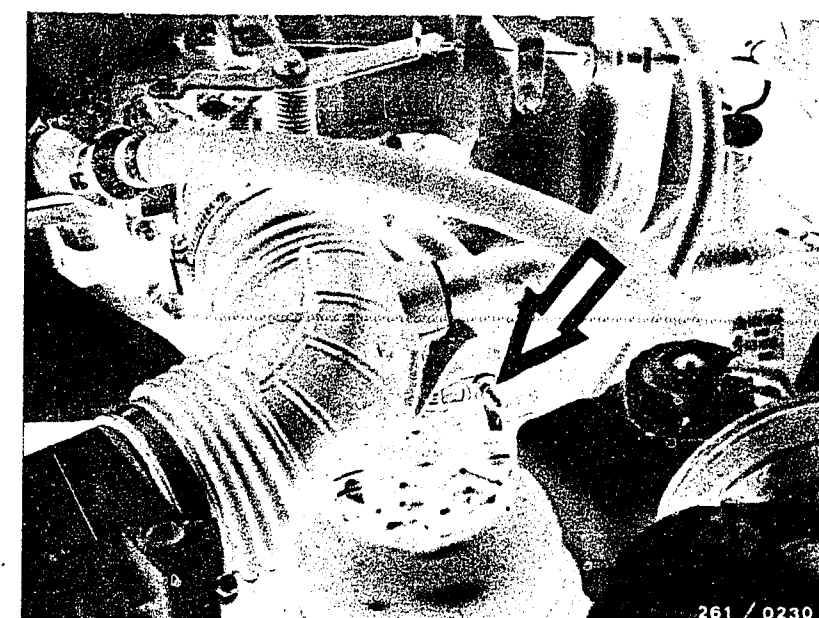
Eliminate contact resistances at the connections.

It must not be possible to shove spring contacts back!



Top view of control unit plug (35-pole), with terminal numbers.
Arrow = "Lug", with mechanical coding

Arrow = Motronic ground terminal



D23

Testing with universal test adapter
BMW 325e (USA)



D24

Testing with universal test adapter
BMW 325e (USA)



TEST STEP 12			
Operation		Reading	Testing
Program switch "V" in setting:	↓	Ohmmeter must read less than 10 Ω. (Measurement is affected by the resistor in the adapter.)	Component: Ground lead
Program switch "Ω" in setting:	12		
Test equipment: Ohmmeter		<div><div>yes</div><div>↓</div><div>Continue test- ing with next test step</div></div> <div><div>no</div><div>↓</div></div>	Operation: Contact resistance between Term. 17 and ground
Scale: 0 to 10 kΩ			Malfunction: Resistance greater than 10 Ω
Connection: Test sockets	Ω		
Operation in vehicle: Switch off ignition			

Trouble-shooting:

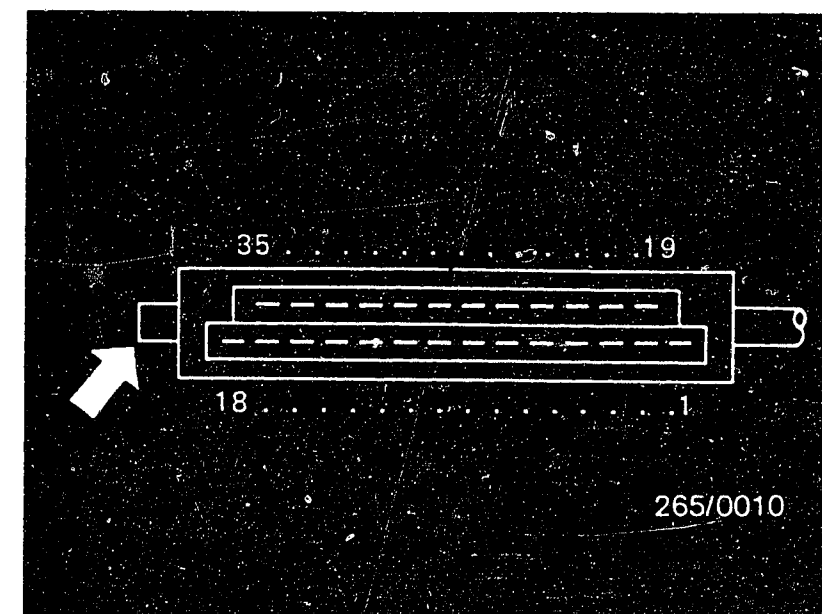
To test, disconnect the wiring harness plug from the test adapter and, if necessary, use a wiring diagram.

Check the following leads for continuity using an ohmmeter (specified value approx. 0 Ω):

- From the control unit plug Term. 17 to the ground terminal.
- From the control unit plug Term. 5 to the ground terminal.

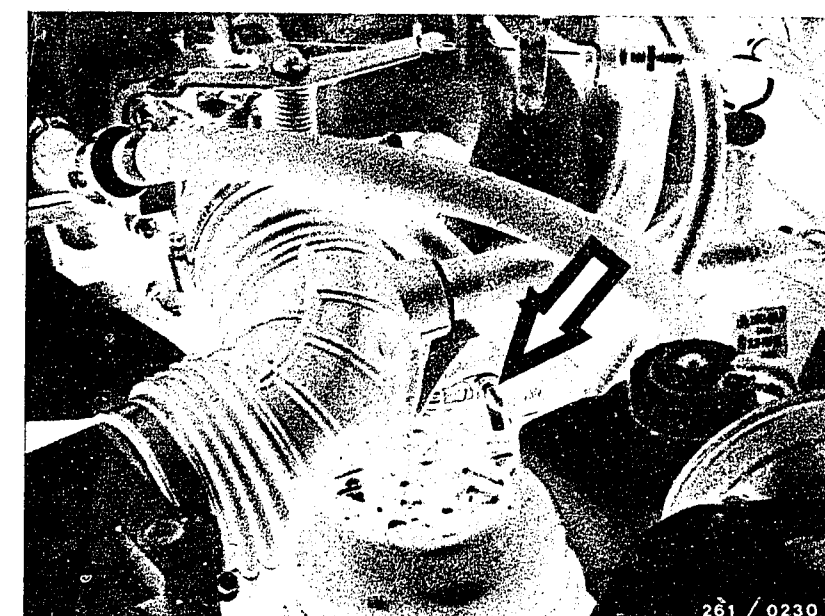
Eliminate contact resistances at the connections.

It must not be possible to shove spring contacts back!



Top view of control unit plug (35-pole), with terminal numbers.
Arrow = "Lug", with mechanical coding

Arrow = Motronic ground terminal



E1

Testing with universal test adapter
BMW 325e (USA)

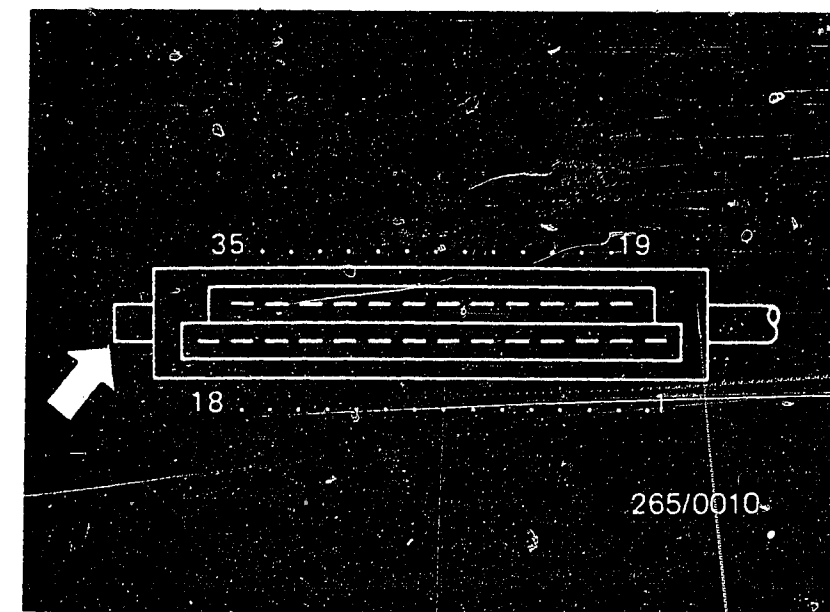


E2

Testing with universal test adapter
BMW 325e (USA)

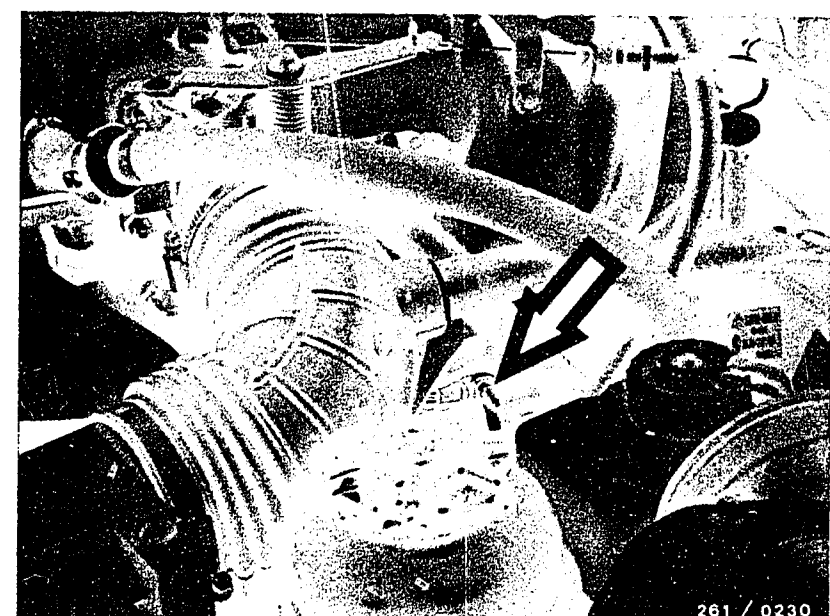


TEST STEP 13:		
Operation		Reading
Program switch "V" in position:	↓	Ohmmeter must read less than 10 Ω
Program switch " Ω " in position:	13	(Measurement is affected by the resistor in the adapter)
Test equipment: Ohmmeter		
Scale: 0 to 10 k Ω		
Connection: Test sockets	Ω	
Operation in vehicle: Switch off ignition		
		yes
		no
		Continue testing with next test step



Top view of control unit plug (35-pole), with terminal numbers.
Arrow = "Lug", with mechanical coding

Arrow = Motronic ground terminal



Trouble-shooting:

To test, disconnect the wiring harness plug from the test adapter and, if necessary, use a wiring diagram.

Check the following leads for continuity using an ohmmeter (specified value approx. 0 Ω):

- From the control unit plug Term. 19 to the ground terminal.
- From the control unit plug Term. 5 to the ground terminal.

Eliminate contact resistances at the connections.

It must not be possible to shove spring contacts back!

E3

Testing with universal test adapter
BMW 325e (USA)



E4

Testing with universal test adapter
BMW 325e (USA)



TEST STEP 15: N.B.! As an exception, voltage is measured at the Ω sockets. Switch the measuring instrument over before switching the ignition on.

Operation		Reading	Testing
<u>Program switch "V"</u> <u>in setting:</u>	↓	Reading for voltage depends upon elevation and battery voltage. As the battery voltage and elevation increase, the wiper voltage at the altitude sensor increases. <u>Elevation above sea level:</u> 0 m: 1.5 ... 3.5 V 500 m: 2.5 ... 5 V 1000 m: 3.5 ... 6.0 V 1500 m: 4.5 ... 7.5 V (V _B between 10 V and 14 ^B V).	<u>Component:</u> Altitude sensor (pressure sensor)
<u>Program switch "Ω"</u> <u>in setting:</u>	14		<u>Operation:</u> Wiper voltage measured on the pressure sensor between Term. 30 and ground.
<u>Test equipment:</u> Voltmeter			<u>Malfunction:</u> No voltage, or voltage not within tolerance
<u>Scale:</u> 15 V			
<u>Connection:</u> Test sockets	Ω		
<u>Operation in vehicle:</u> Switch ignition on			

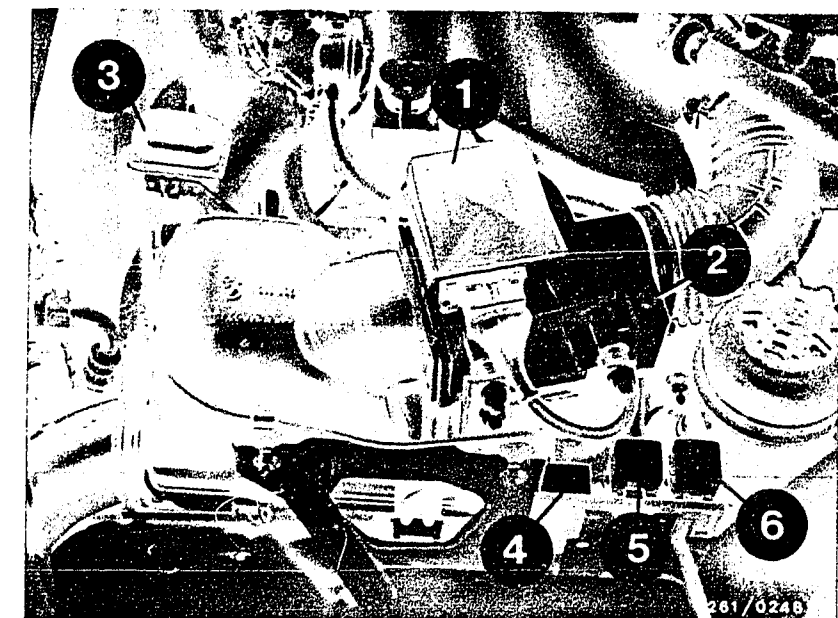
Trouble-shooting:

No voltage measurable:

With test step 20, find out if the main relay is O.K. If the main relay is O.K., check the lead from the main relay to the altitude sensor. If the lead and the plug connection are O.K., take out and replace the pressure sensor.

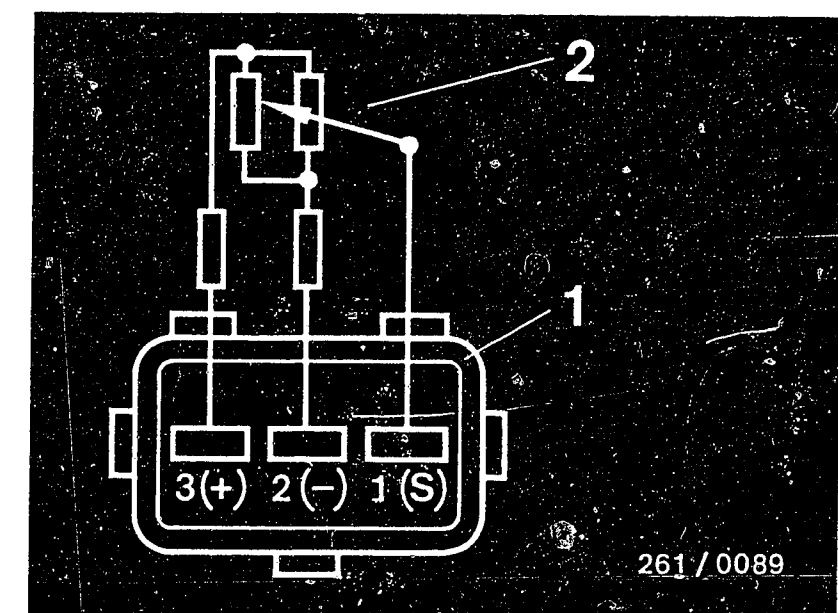
Voltage not within tolerance:

Watch the atmospheric pressure and battery voltage!
Take out and replace the altitude sensor.



3 = Altitude sensor

1 = Top view of plug connection on the pressure sensor
S = Potentiometer wiper
2 = Altitude sensor potentiometer



E7

Testing with universal test adapter
BMW 325e (USA)

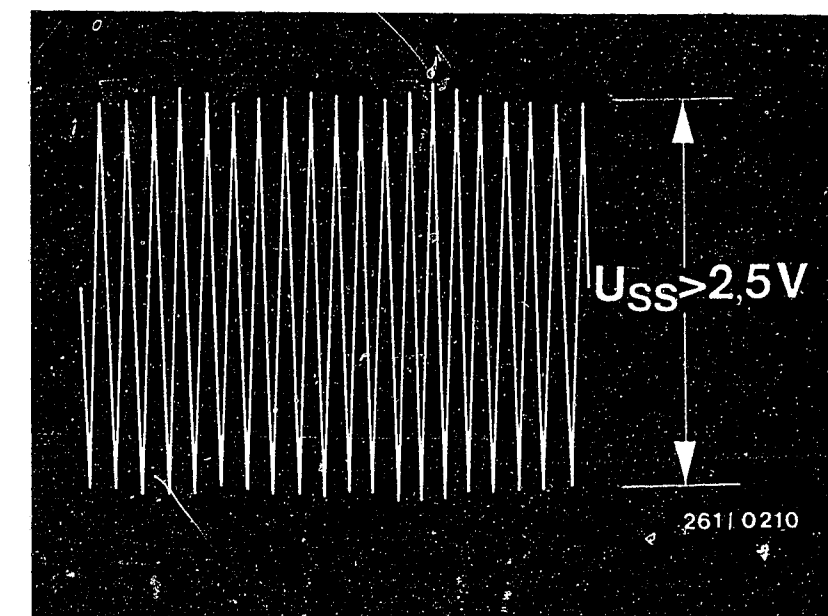


E8

Testing with universal test adapter
BMW 325e (USA)

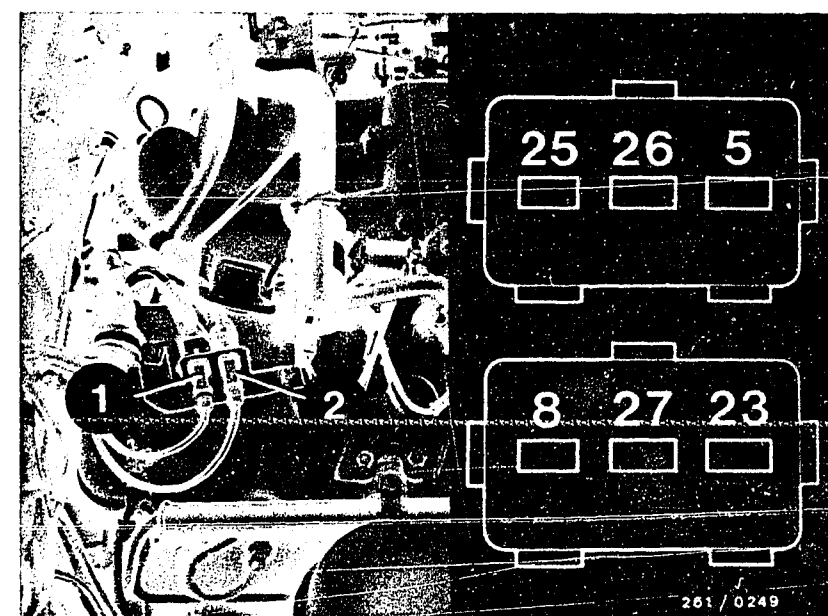


TEST STEP 16		
Operation	Reading	Testing
Program switch "V" in setting:	1	Component: Rotational-speed sensor
Program switch "S" in setting:	15	
Test equipment: Motortester, oscilloscope	<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> yes ↓ Continue testing with next test step </div> <div style="text-align: center;"> no ↓ </div> </div>	Operation: Amplitude (signal) at Terminals 8 and 27
Scale: Special input		Malfunction: No signal or too small a signal. Incorrect signal.
Connection: Test wells. Red clip to red well, black clip to black well		
Operation in vehicle: Shift into neutral and start engine		



Rotational-speed sensor signal

- 1 = Plug connection for reference mark sensor, with gray plug
2 = Plug connection for rotational-speed sensor, with black plug



E9

Testing with universal test adapter
BMW 325e (USA)



E10

Testing with universal test adapter
BMW 325e (USA)



Trouble-shooting TEST STEP 16 (continued)

- Taking out and replacing the rotational-speed sensor:
Unscrew the socket hex screw on the sensor.
Remove dirt deposits on the sensor. If necessary, insert two screwdrivers into the recesses at the left and right of the sensor and lift the sensor.
- Incorrect signal (severely extended, in the figure at the bottom):

Severely damaged tooth on the starting motor ring gear take out and replace the ring gear.

Before installing the sensors, make certain that no metal parts are clinging to the sensor. (The sensors contain permanent magnets.) Grease the sensors with Molykote Longterm 2.

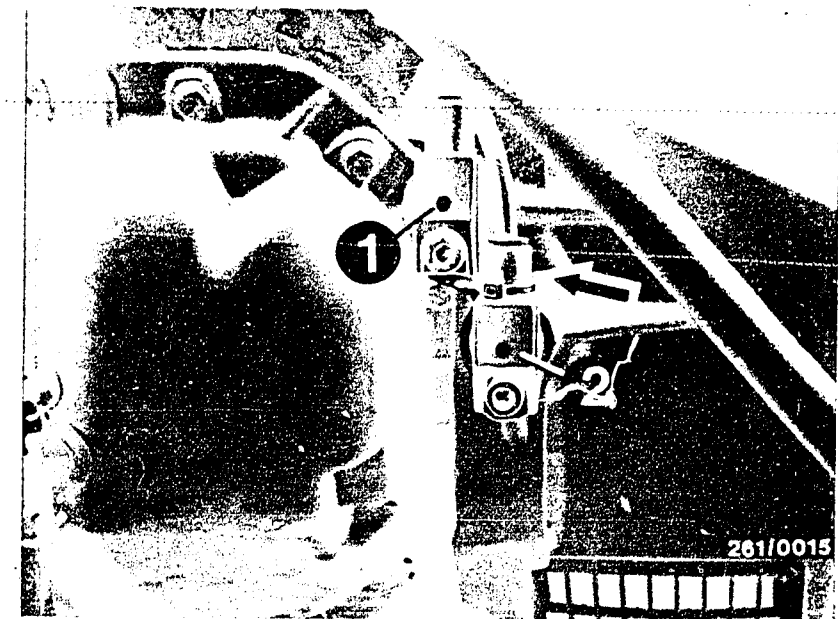
Do not confuse sensors one for the other on installation!

Watch the identification marking: Reference mark sensor with identification, and/or gray plug.
Rotational-speed sensor without, black plug.

The sensors are inserted into the hole as far as the stop and screwed tight. Do not use any force when putting them in.

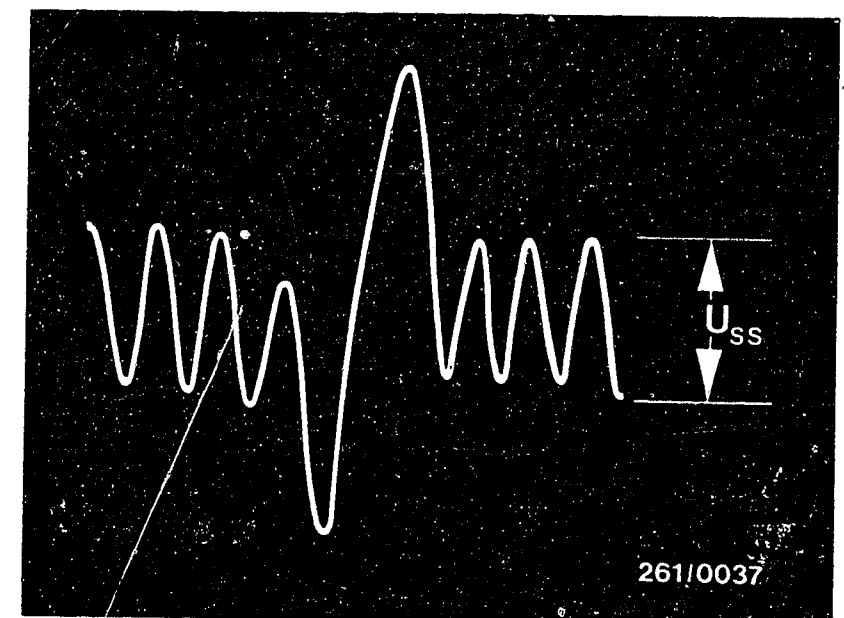
On putting them in, make certain that the couplings are properly assigned!

Watch for proper seating and latching of the spring contacts in the plugs! It must not be possible to shove the spring contacts back!



1 = Rotational-speed sensor
2 = Reference mark sensor
Arrow = Identification marking for reference mark sensor

Defective rotational-speed sensor signal



E11

Testing with universal test adapter
BMW 325e (USA)



E12

Testing with universal test adapter
BMW 325e (USA)



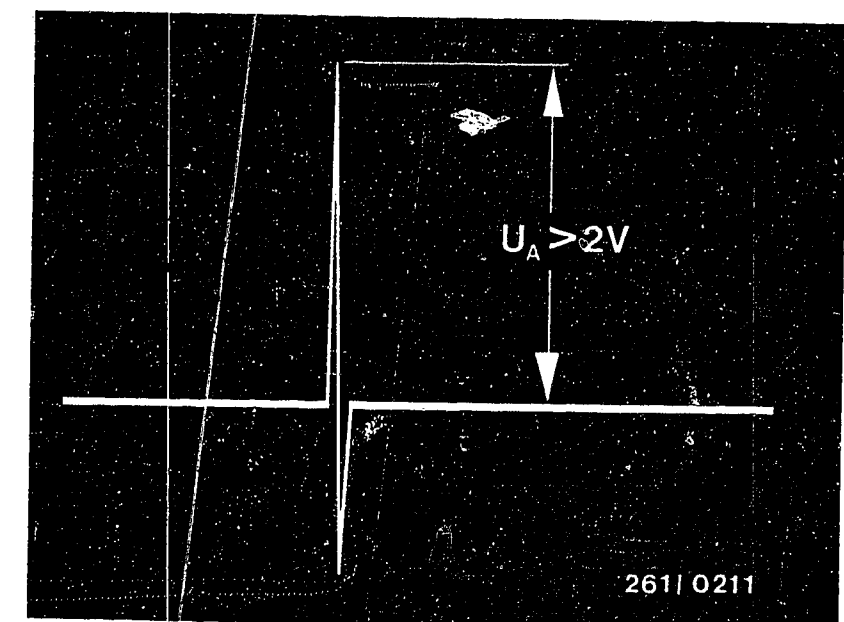
TEST STEP 17:			
Operation		Reading	Testing
Program switch "V" in setting	2	Reference mark sensor - signal (see figure at top)	Component: Reference mark sensor
Program switch "Ω" in setting:	15		
Test equipment: Motortester, oscilloscope			
Scale: Special input		<div><div>yes</div><div>Continue test- ing with test step 20. (Test steps 18 and 19 are not used.)</div></div> <div>no</div>	Operation: Amplitude (signal) at Terminals 25 and 26
Connection: Test wells, red clip to red well, black clip to black well			
Operation in vehicle: Shift into neutral and start the engine.			Malfunction: No signal or too small a signal. Incorrect signal: Negative peak comes first.

Trouble-shooting:

No signal, or too small a signal:

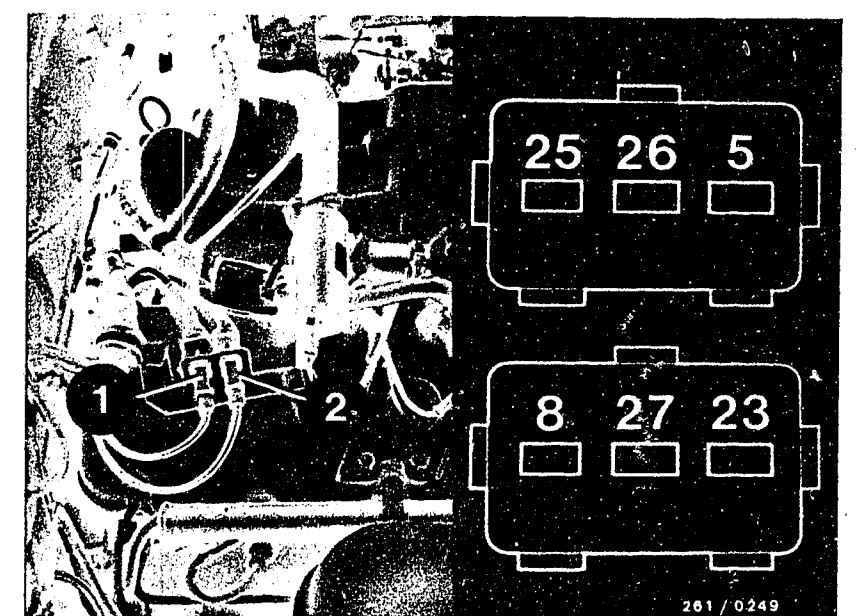
- Cranking speed under 200 min : Charge the battery.

Continued on E15/E16



Reference mark sensor signal
Positive peak must come first.

- 1 = Plug connection for reference mark sensor with gray plug
- 2 = Plug connection for rotational-speed sensor, with black plug



E13

Testing with universal test adapter
BMW 325e (USA)



E14

Testing with universal test adapter
BMW 325e (USA)



Trouble-shooting TEST STEP 17 (continued)

- Check the nominal air gap $a = 0.8 \text{ mm}$:
Remove the coverplate from the ring gear housing
The reference mark (3) can be moved up to the reference mark sensor by turning the ring gear, e.g., with a wrench. Measurement of the air gap (a) with a feeler gauge.

Incorrect signal:

- The signal is incorrect if the negative peak comes first. Check assignment of leads according to the wiring diagram and the figure at the right.
- Taking out and replacing the reference mark sensor:
Unscrew the socket hex screw on the sensor. Remove dirt deposits on the sensor. If necessary, insert two screwdrivers into the recesses at the left and the right of the sensor and lift the sensor.

Before putting the sensor in, make certain that no metal parts cling to it. (The sensors contain permanent magnets.) Grease the sensors with Molykote Longterm.

Do not confuse the sensors one for the other on installation!

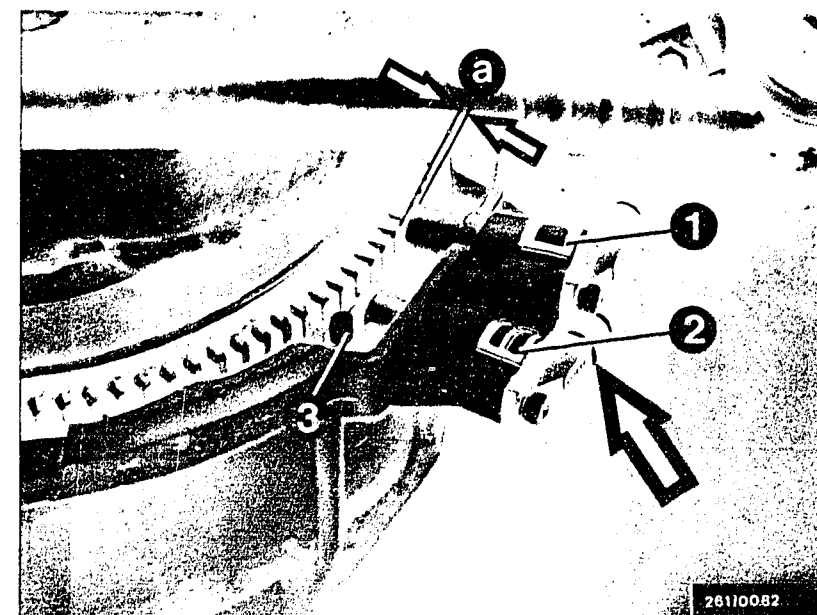
Watch the identification marking:

The reference mark sensor is identified with a cable binder

The sensors are inserted into the hole down to the stop, and screwed tight. Do not use any force when putting them in.

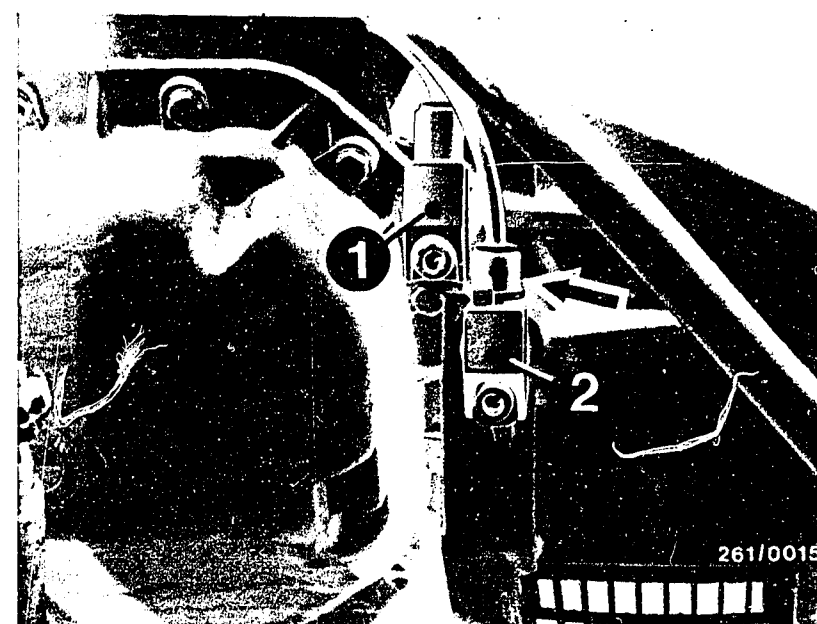
On assembly, make certain that the couplings are correctly assigned!

Make certain that there is a proper seating and latching of the spring contacts in the plug! It must not be possible to shove the spring contacts back!



1 = Rotational-speed sensor (D)
2 = Reference mark sensor (B)
3 = Reference mark
a = Air gap
Arrow = Identification marking for reference mark sensor

1 = Rotational-speed sensor
2 = Reference mark sensor
Arrow = Identification marking on the reference mark sensor



E15

Testing with universal test adapter
BMW 325e (USA)

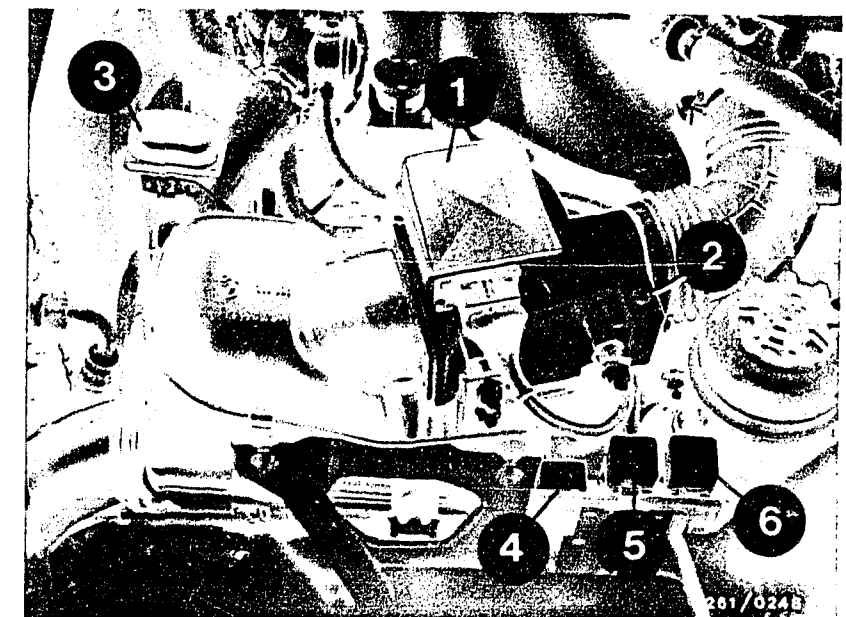


E16

Testing with universal test adapter
BMW 325e (USA)



TEST STEP 20: (Test steps 18 and 19 are not used.)			
Operation		Reading	Testing
Program switch "V" in setting:	6	Voltmeter must read <u>10 ... 15 V.</u>	Component: Relay 2 (main relay)
Program switch "Ω" in setting:	15		
Test equipment:		<div> <div>yes</div> <div>↓</div> <div>Continue test- ing with <u>next</u> test step.</div> </div> <div>no</div> <div>↓</div>	Operation: Supply voltage for the control unit at terminals 35 (+) and 5 (ground)
Voltmeter			
Scale:			
15 V			
Connection:			Malfunction: Voltage less than 10 V
Test sockets (red = +, black = ground)	V		
Operation in vehicle: Switch ignition on			



- 4 = Relay 2 (main relay)
5 = Relay for sensor heater
6 = Relay 1 (pump relay)

Arrow = Motronic ground terminal



Trouble-shooting:

1. Voltage less than 10 V: Battery insufficiently charged, or high voltage drops at the terminal points.
2. No reading for voltage: Check relay 2. Take the following measurements for voltage at the relay with the ignition switched on:
 - Measure battery voltage at Term. 87 (2x), Term. 86. and Term. 30.
 - Measure the ground connection Term. 85 to B+ (test adapter connected).
 - Check the lead from relay 2 Term. 87 to the control unit plug Term. 35.
 - Check the Motronic ground terminal, and lead 5

Note: When taking out and replacing relay 2, be certain to install only a relay with a blocking diode! Watch the wiring symbol on the relay housing!

E17

Testing with universal test adapter
BMW 325e (USA)



E18

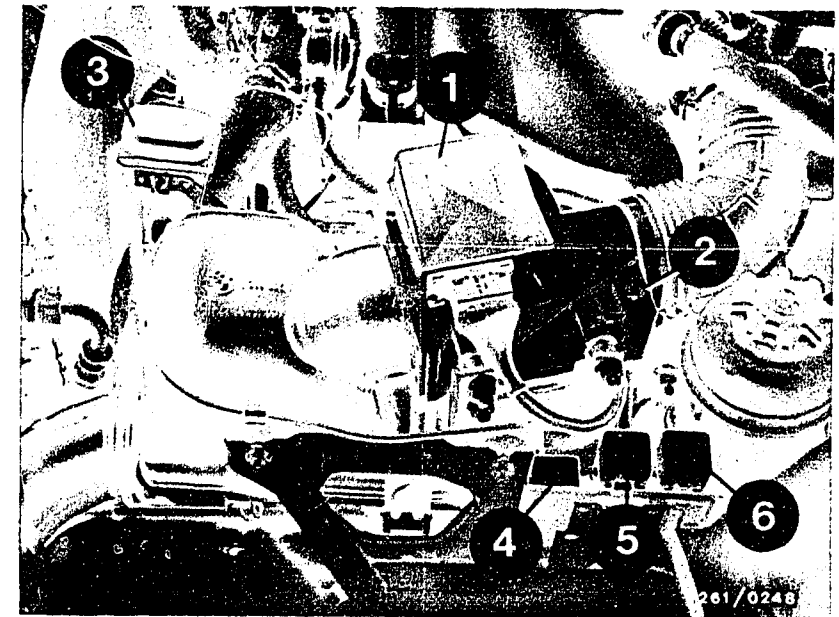
Testing with universal test adapter
BMW 325e (USA)



Operation		Reading	Testing
<u>Program switch "V"</u> in setting:	7	Voltmeter must read <u>10 ... 15 V.</u>	<u>Component:</u> Relay 2 (main relay)
<u>Program switch "Ω"</u> in setting:	15		
<u>Test equipment:</u> Voltmeter		<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>yes</p> <p>↓</p> <p>Continue test- ing with <u>next</u> test step.</p> </div> <div style="text-align: center;"> <p>no</p> <p>↓</p> </div> </div>	<u>Operation:</u> Supply voltage for the control unit at terminals 18 (+) and 5 (ground)
<u>Scale:</u> 15 V			
<u>Connections:</u> Test sockets (red = +, black = ground)	V		<u>Malfunction:</u> Voltage less than 10 V
<u>Operation in vehicle:</u> Switch ignition on			

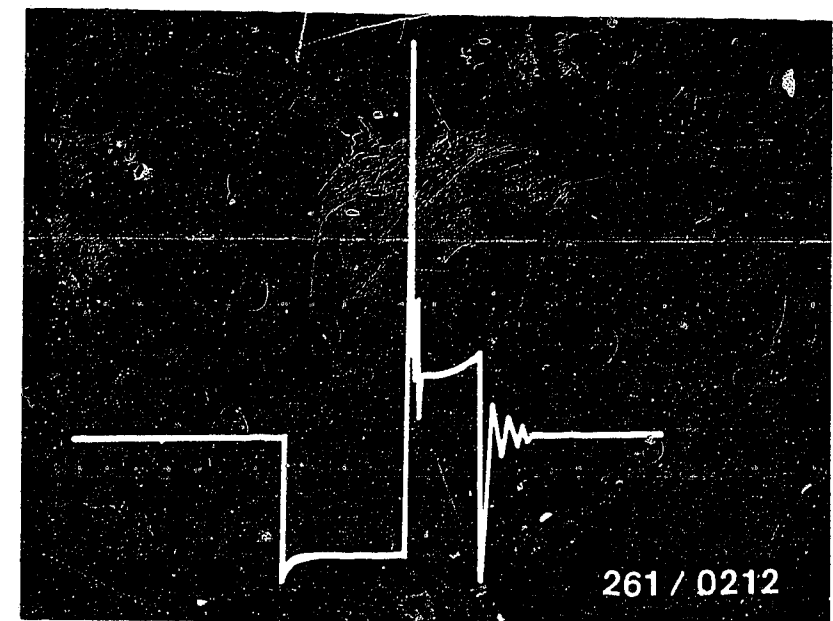
- Check lead from the control unit plug Term. 18 to relay 2 Term. 87.

Note: When taking out and replacing relay 2, make certain that only a relay with a blocking diode is installed! Watch the wiring symbol on the relay housing!



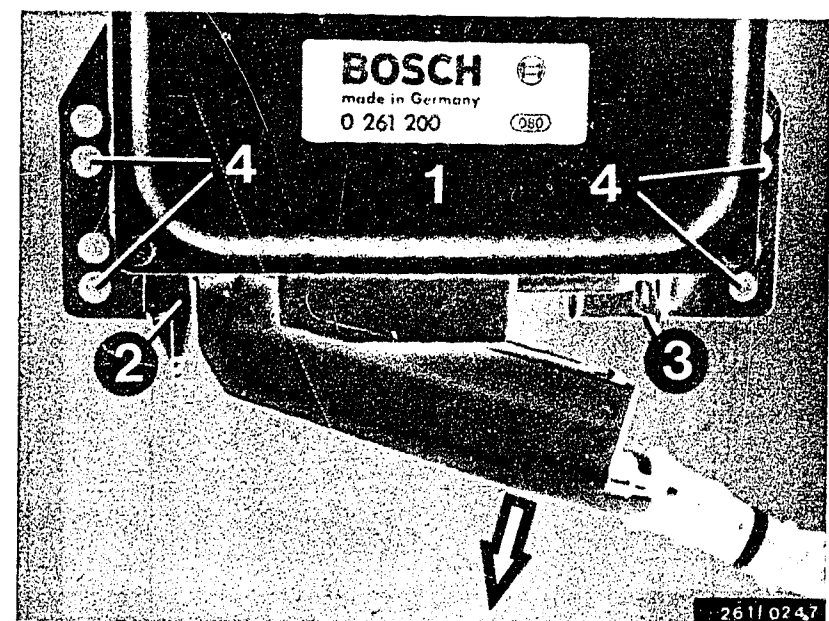
4 = Relay 2 (main relay)
5 = Relay for sensor heater
6 = Relay 1 (pump relay)

TEST STEP 22 Ignition off, connect control unit. Test chart is valid for control unit 0 261 200 021		
Operation	Reading	Testing
Program switch "V" in setting:	5	<u>Component:</u> Ignition coil, ignition leads. Control unit
Program switch "Ω" in setting:	15	
Test equipment: Motortester, oscilloscope		<u>Operation:</u> Primary signal from ignition coil Terminal 1 to ground <u>Malfunction:</u> No signal or incorrect signal
Scale: Special input	<div> <div>yes</div> <div>no</div> </div>	
<u>Connection:</u> Test wells. Red clip to red well, black clip to black well. Triggering at cylinder 1.	Continue test- ing with next test step.	
<u>Operation in vehicle:</u> Shift into neutral and start the engine		



Primary signal

- 1 = Control unit
- 2 = Lug
- 3 = Plug detent
- 4 = Fastening holes



Trouble-shooting:

- Checking the Motronic ground terminal:
The terminal point must be bright and the screw must be tightened firmly.
- Check the ignition coil including the leads and the high voltage leads.
It must not be possible to shove back the spring contact on control unit plug Term. 1.
- Check the lead from ignition coil Term. 15 to the ignition lock Term. 15.
- Take out and replace the control unit.

Note:

In order to preclude confusing the control units for the various systems one for the other, a mechanical encoding system has been introduced. The "lug" (pivot point for connecting and disconnecting the control unit) and the corresponding receptacle on the control unit have recesses or pins that fit one another.

E21

Testing with universal test adapter
BMW 325e (USA)



E22

Testing with universal test adapter
BMW 325e (USA)



TEST STEP 23				
Operation		Reading	Testing	
Program switch "V" in position:		8	Component: Control unit	
Program switch "Ω" in position:		15		
Test equipment: Voltmeter		<div><div>yes</div><div>↓</div><div>Continue testing with <u>next test step</u></div></div> <div>no</div> <div>↓</div>	Operation: Supply voltage for air-flow sensor at Terminal 9 and ground.	
Scale: 15 V				
Connection: Test sockets, (red = +, black = ground)				Malfunction: Voltage less than 8 V
Operation in vehicle: Switch ignition on				

Component:

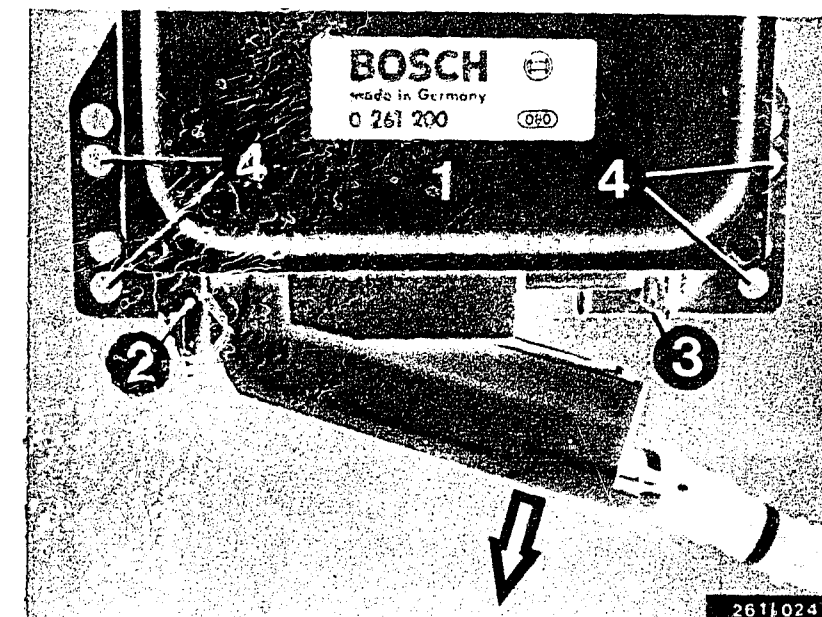
Control unit

Operation:

Supply voltage for air-flow sensor at Terminal 9 and ground.

Malfunction:

Voltage less than 8 V



- 1 = Control unit
- 2 = Lug
- 3 = Plug detent
- 4 = Fastening holes

Trouble-shooting

- Take out and replace the control unit.

Note:

In order to preclude confusing the control units for the various systems one for the other, a mechanical encoding system has been introduced. The "lug" (pivot point for connecting and disconnecting the control unit) and the corresponding receptacle on the control unit have recesses or pins that fit one another.

E23

Testing with universal test adapter
BMW 325e (USA)



E24

Testing with universal test adapter
BMW 325e (USA)

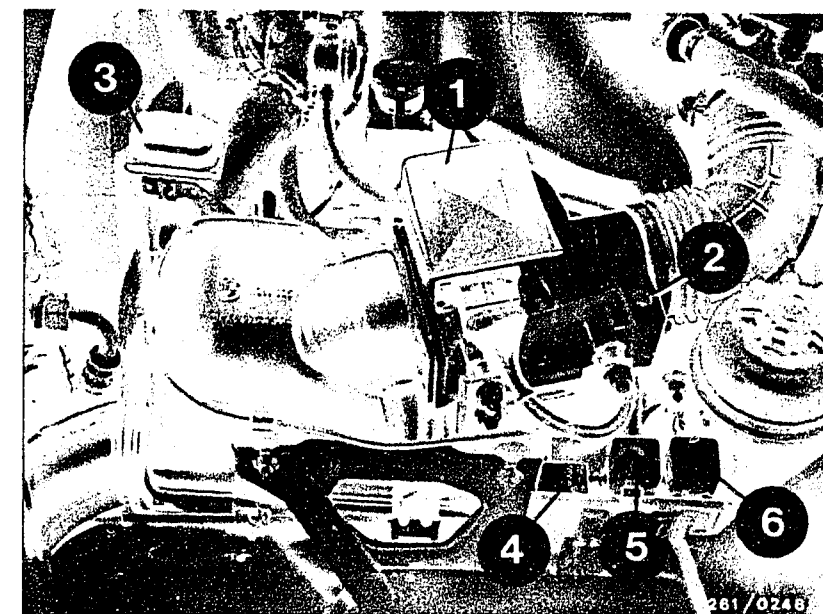


TEST STEP 24			
Operation		Reading	Testing
<u>Program switch "V"</u> <u>in position:</u>	9	With the air-flow sensor flap closed, voltmeter must read: <u>150 ... 250 mV.</u>	<u>Component:</u> Air-flow sensor
<u>Program switch "Ω"</u> <u>in position:</u>	15	Disconnect the hose from the air-flow sensor and open the air-flow sensor flap by hand. The sensor flap must not jam and must return to the at rest position by itself when released. When the air-flow sensor flap is fully open, reading rises to <u>more than 7 V</u> (switch over the measuring scale.)	<u>Operation:</u> Divider voltage at Terminal 7 and ground
<u>Test equipment:</u> Voltmeter			
<u>Scale:</u> 1.5 V			
<u>Connection:</u> Test sockets (red = +, black = ground)	V		
<u>Operation in vehicle:</u> Ignition on		yes ↓ Continue testing with <u>test step 27.</u> (Test steps 25 and 26 are not used.)	<u>Malfunction:</u> No voltage or voltage less than 150 mV or greater than 250 mV
		no ↓	

Trouble-shooting:

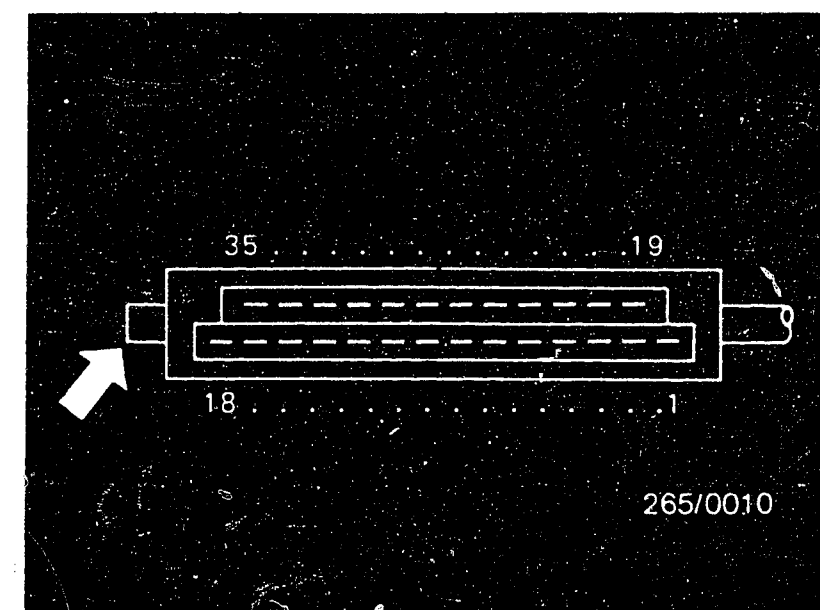
No reading:

- Check the lead from the air-flow sensor Term. 6, 7, and 9 to the control unit plug Term. 6, 7, and 9!
 - It must not be possible to shove the spring contacts back.
- If the reading is not within tolerance:
- Check whether the air-flow sensor flap closes completely.
 - Take out and replace the air-flow sensor.



- 1 = Air-flow sensor with NTC I
2 = Idle-mixture-adjusting screw

Top view of control unit plug (35-pole), with terminal numbers.
Arrow = "Lug", with mechanical coding



F1

Testing with universal test adapter
BMW 325e (USA)

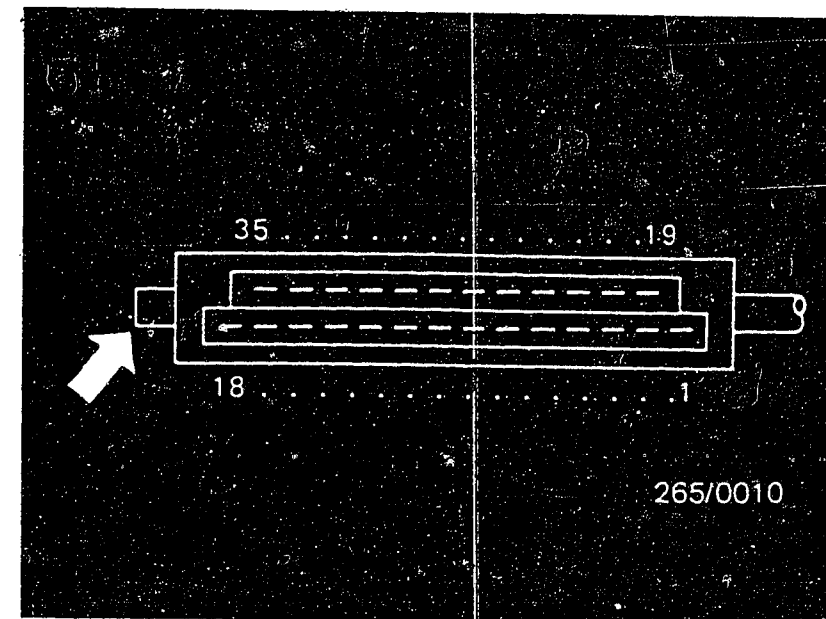


F2

Testing with universal test adapter
BMW 325e (USA)



TEST STEP 27: (Test steps 25 and 26 are not used)			
Operation		Reading	Testing
Program switch "V" in setting:	12	During the starting process, the voltmeter must read 8 ... 15 V	<u>Component:</u> Lead 4 from the starting motor Term. 50 to the control unit plug Term. 4
Program switch "Ω" in setting:	15		
Test equipment: Voltmeter			
Scale 15 V		<div> <div>yes</div> <div>no</div> </div>	<u>Operation:</u> Voltage test at Terminal 4
Connection: Test sockets (red = +, black = ground)	V		<u>Malfunction:</u> Voltage less than 8 V
Operation in vehicle: Shift into neutral and start the engine.			



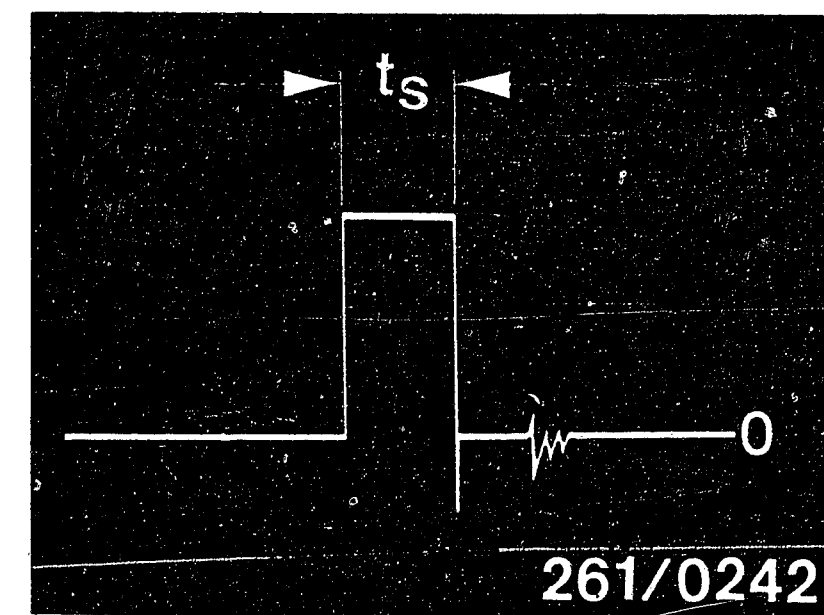
Top view of control unit plug (35-pole), with terminal numbers.
Arrow = "Lug", with mechanical coding

Trouble-shooting:

1. Voltage less than 8 V:

- Check the voltage at the starting motor Terminal 50.
- Check the lead from the control unit plug Terminal 4 to the starting motor Terminal 50.

TEST STEP 28:			
Operation		Reading	Testing
Program switch "V" in setting	13	Dwell period signal (See Figure at top)	Component: Control unit
Program switch "Ω" in setting	15		
Test equipment: Motortester, oscilloscope		<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <div style="width: 10px; height: 10px; border: 1px solid black; margin: 0 auto;"></div> <p>yes</p> <p>↓</p> <p>Continue test- ing with <u>next</u> test step.</p> </div> <div style="text-align: center;"> <div style="width: 10px; height: 10px; border: 1px solid black; margin: 0 auto;"></div> <p>no</p> <p>↓</p> </div> </div>	Operation: Dwell period signal at Terminal 21 and ground
Scale: Special input			Malfunction: No signal
Connection: Test wells. Red clip to red well, black clip to black well.			
Operation in vehicle: Shift into neutral and start the engine.			



t_s = Dwell period
0 = Zero line

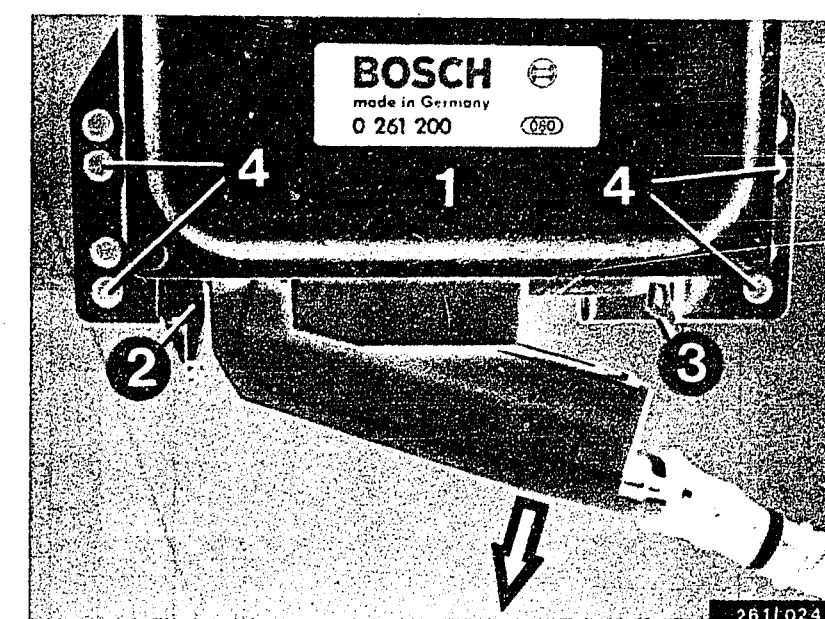
- 1 = Control unit
- 2 = Lug
- 3 = Plug detent
- 4 = Fastening holes

Trouble-shooting:

- Take out and replace the control unit.

Note:

In order to preclude confusing the control units for the various systems one for the other, a mechanical encoding system has been introduced. The "lug" (pivot point for connecting and disconnecting the control unit) and the corresponding receptacle on the control unit have recesses or pins that fit one another.



F5

Testing with the universal test adapter
BMW 325e (USA)



F6

Testing with the universal test adapter
BMW 325e (USA)



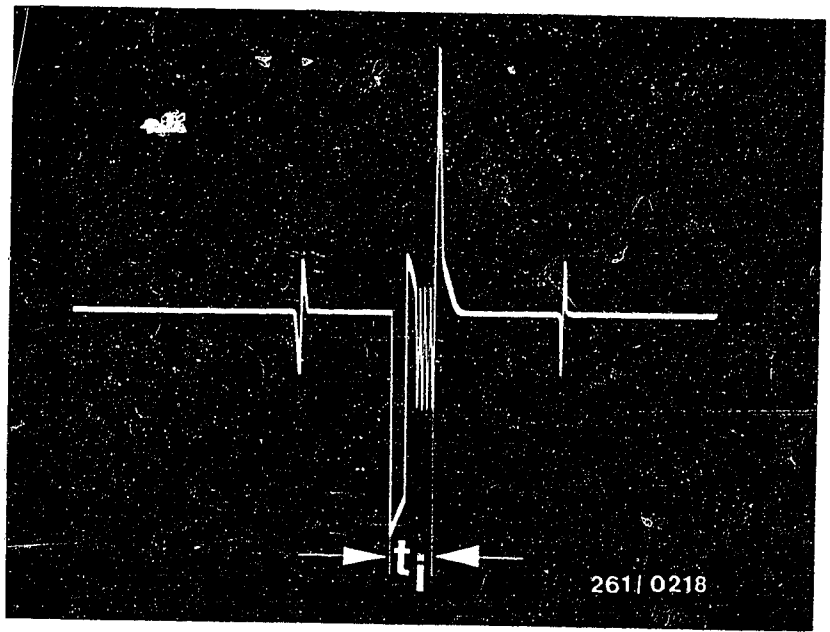
TEST STEP 29			
Operation		Reading	Testing
<u>Program switch "V" in setting:</u>	14	<u>Fuel-injection signal</u> (See Figure at top)	<u>Component:</u> Power supply for solenoid-operated fuel-injection valves, control unit
<u>Program switch "Ω" in setting:</u>	15		
<u>Test equipment:</u> Motortester, oscilloscope		<div><div>yes</div><div>no</div></div>	<u>Operation:</u> Fuel-injection output stage at Terminal 14 and ground
<u>Scale:</u> Special input			
<u>Connection:</u> Test wells. Red clip to red well, black clip to black well.			
<u>Operation in vehicle:</u> Shift into neutral and start the engine.			
		<u>Continue test-</u> <u>ing with next</u> <u>test step.</u>	<u>Malfunction:</u> No signal

Trouble-shooting:

- Check the power supply for the solenoid-operated fuel-injection valves:
Disconnect the connector from all the solenoid-operated fuel-injection valves. Measure the voltage at the two terminals on the valve connector. Battery voltage must be measured once at each valve connector. If there is no voltage present, check the lead from the valve connector to relay 2, Term. 87.
- Check the lead from the control unit plug Term. 14 to the solenoid-operated fuel-injection valves for Cylinders 1, 2, and 3.
- Take out and replace the control unit.

Note:

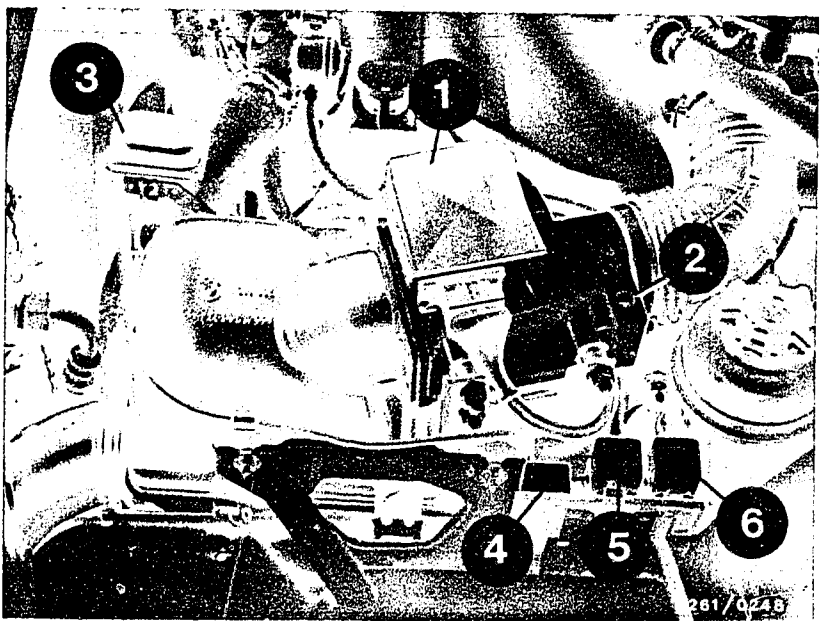
In order to preclude confusing the control units for the various systems one for the other, a mechanical encoding system has been introduced. The "lug" (pivot point for connecting and disconnecting the control unit) and the corresponding receptacle on the control unit have recesses or pins that fit one another.



tj = Fuel injection period

Watch for interference (interference pulses).

- 4 = Relay 2 (main relay)
- 5 = Relay for sensor heater
- 6 = Relay 1 (pump relay)



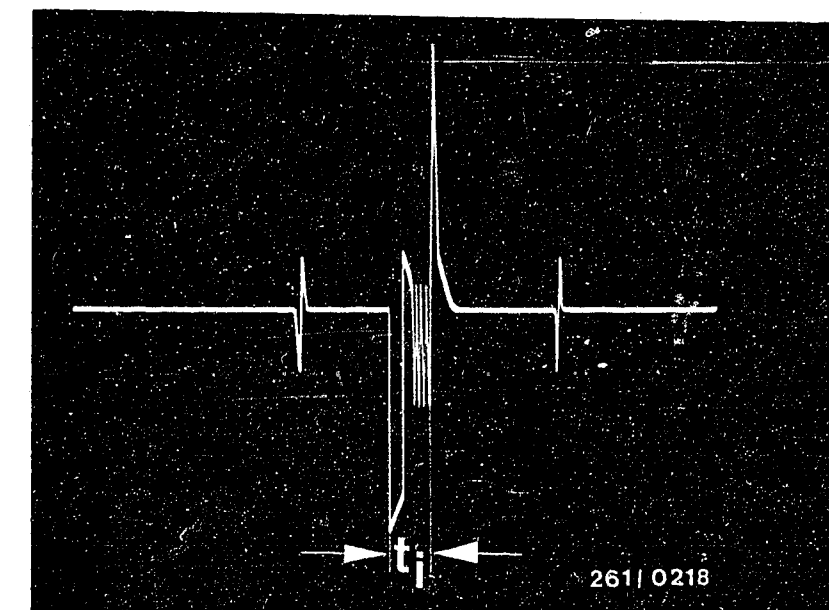
TEST STEP 30			
Operation		Reading	Testing
<u>Program switch "V"</u> <u>in setting:</u>	14	After button T1 (NTC II, cold) is pressed, the duration of injection t_i becomes somewhat longer!	<u>Component:</u> Control unit
<u>Program switch "Ω"</u> <u>in setting:</u>	15	<u>Press T1 only briefly, or the engine will be supplied too richly.</u>	
<u>Test equipment:</u> Motortester, oscilloscope			
<u>Scale:</u> Special input		<div><div>yes</div><div>↓</div><div>Continue testing with <u>next test step.</u></div></div> <div><div>no</div><div>↓</div></div>	<u>Operation:</u> Effect of temperature
<u>Connection:</u> Test wells. Red clip to red well, black clip to black well.			
<u>Operation in vehicle:</u> Shift into neutral and start the engine			
<u>Button:</u> Press T1			
			<u>Malfunction:</u> The signal does not become wider when T1 is pressed.

Trouble-shooting:

Take out and replace the control unit.

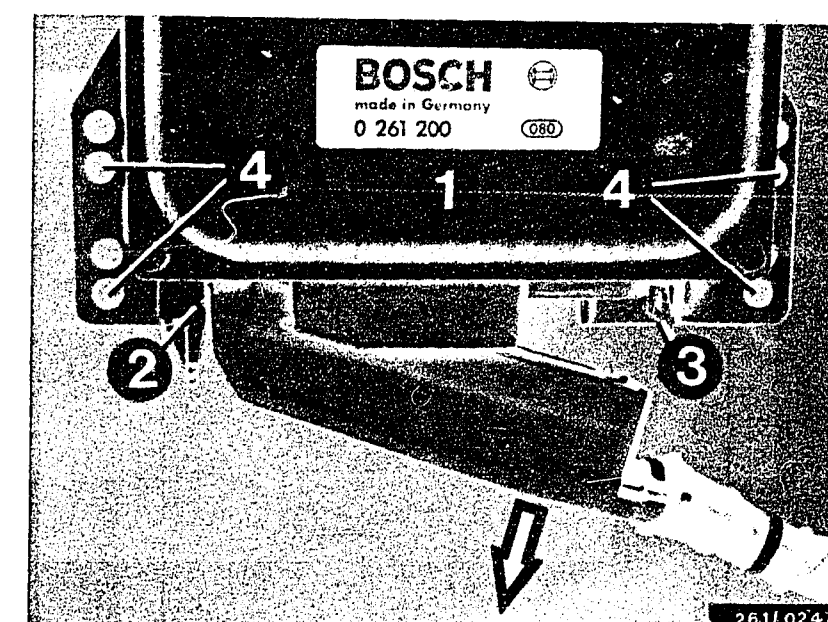
Note:

In order to preclude confusing the control units for the various systems one for the other, a mechanical encoding system has been introduced. The "lug" (pivot point for connecting and disconnecting the control unit) and the corresponding receptacle on the control unit have recesses or pins that fit one another.



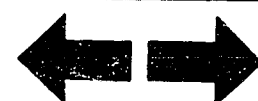
Fuel-injection signal
 t_i = Fuel-injection time

- 1 = Control unit
- 2 = Lug
- 3 = Plug detent
- 4 = Fastening holes



F9

Testing with the universal test adapter
BMW 325e (USA)

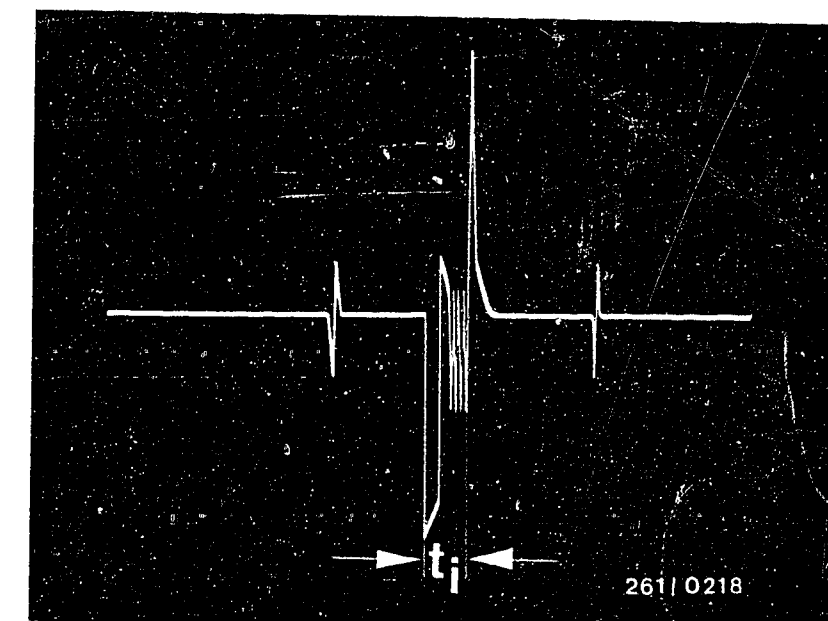


F10

Testing with the universal test adapter
BMW 325e (USA)



TEST STEP 31			
Operation		Reading	Testing
<u>Program switch "V"</u> <u>in setting:</u>	15	<u>Fuel-injection signal</u> (See Figure at the top)	<u>Component:</u> Control unit
<u>Program switch "Ω"</u> <u>in setting:</u>	15		
<u>Test equipment:</u> Motortester, oscilloscope			
<u>Scale:</u> Special input		yes	<u>Operation:</u> Fuel-injection output stage at Terminal 15 and ground
<u>Connection:</u> Test wells. Red clip to red well, black clip to black well.		no	
<u>Operation in vehicle:</u> Shift into neutral and start the engine.		<div>Continue test- ing with <u>next</u> test step.</div>	<u>Malfunction:</u> No signal



Fuel-injection signal
ti = Fuel-injection time

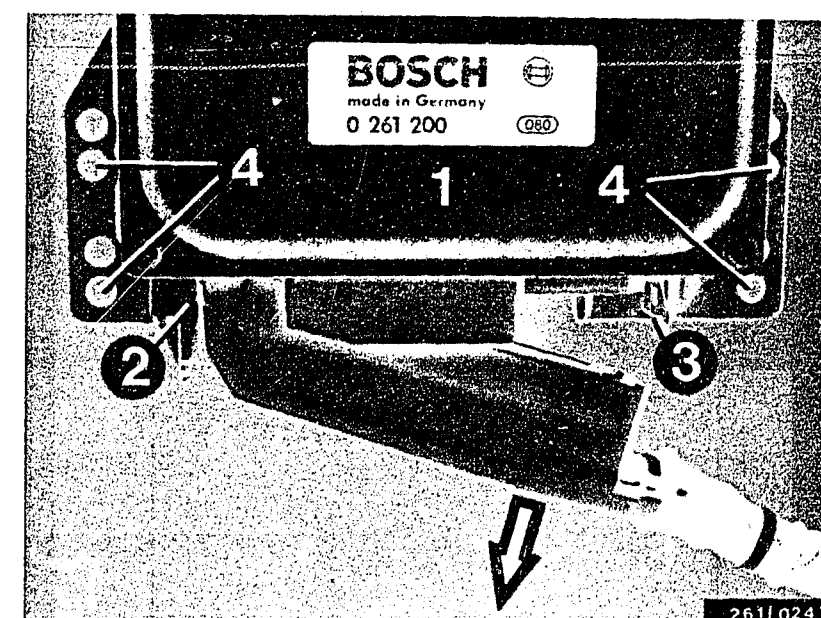
- 1 = Control unit
- 2 = Lug
- 3 = Plug detent
- 4 = Fastening holes

Trouble-shooting:

- Check the power supply for the solenoid-operated fuel-injection valves. Disconnect the connectors from all the solenoid-operated fuel-injection valves. Measure the voltage at both terminals on the valve connector. Battery voltage must be measured once at each valve connector. If there is no voltage present, check the lead from the valve connector to relay to Term. 87.
- Check the lead from the control unit plug Term. 15 to the solenoid-operated fuel-injection valves for cylinders 4, 5, and 6.
- Take out and replace the control unit.

Note:

In order to preclude confusing the control units for the various systems one for the other, a mechanical encoding system has been introduced. The "lug" (pivot point for connecting and disconnecting the control unit) and the corresponding receptacle on the control unit have recesses or pins that fit one another.



F11

Testing with the universal test adapter
BMW 325e (USA)



F12

Testing with the universal test adapter
BMW 325e (USA)



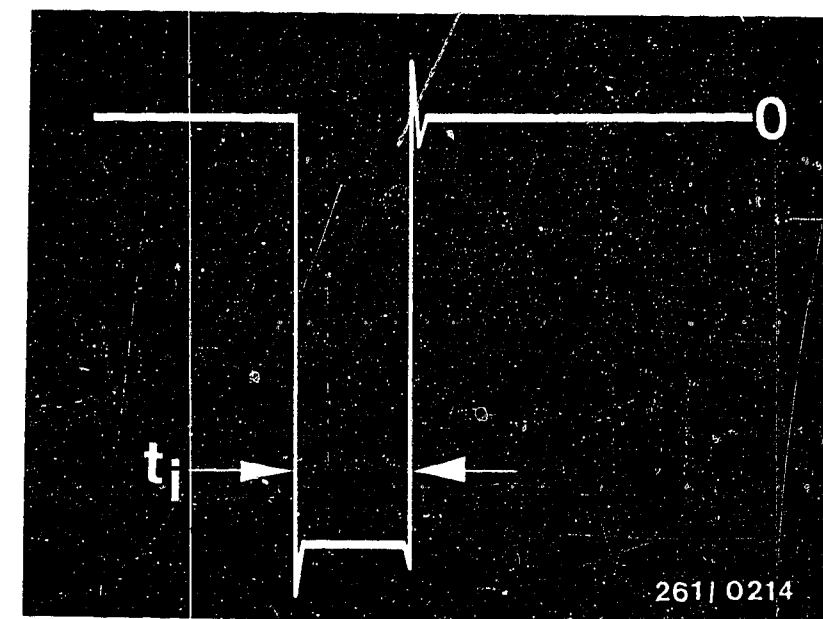
TEST STEP 32			
Operation		Reading	Testing
<u>Program switch "V"</u> <u>in setting:</u>	16	<u>Fuel-injection signal</u> (See Figure at top)	<u>Component:</u> Control unit
<u>Program switch "Ω"</u> <u>in setting:</u>	15		
<u>Test equipment:</u> Motortester, oscilloscope		<div><div>yes</div><div>↓</div><div><u>Continue test-</u> <u>ing with next</u> <u>test step.</u></div></div>	<div><u>Operation:</u> Fuel-injection signal at Terminal 11 and ground</div> <div><u>Malfunction:</u> No signal</div>
<u>Scale:</u> Special input			
<u>Connection:</u> Tests wells. Red clip to red well, black clip to black well.			
<u>Operation in vehicle:</u> Shift into neutral and start the engine.			

Trouble-shooting:

Take out and replace the control unit.

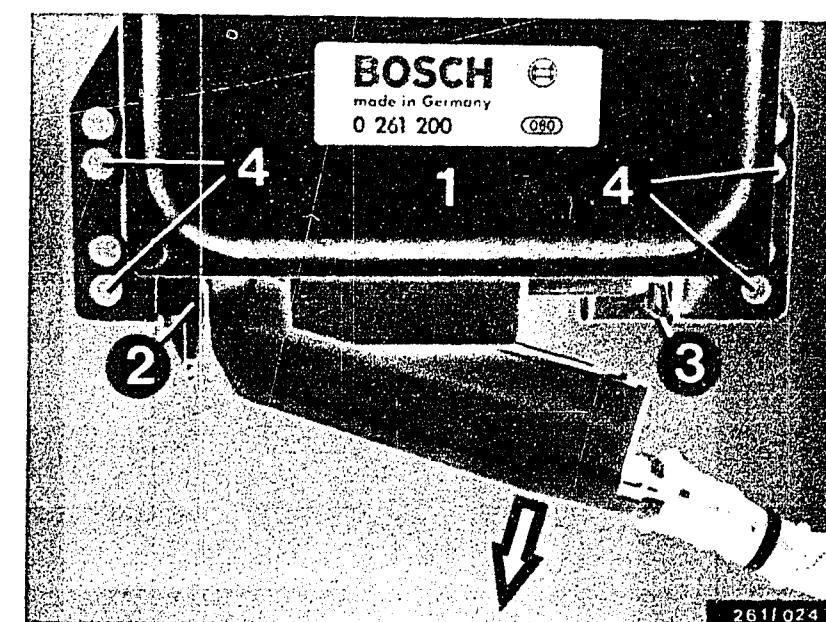
Note:

In order to preclude confusing the control units for the various systems one for the other, a mechanical encoding system has been introduced. The "lug" (pivot point for connecting and disconnecting the control unit) and the corresponding receptacle on the control unit have recesses or pins that fit one another.



t_i = Fuel-injection
0 = Zero line

- 1 = Control unit
- 2 = Lug
- 3 = Plug detent
- 4 = Fastening holes



F13

Testing with the universal test adapter
BMW 325e (USA)



F14

Testing with the universal test adapter
BMW 325e (USA)



TEST STEP 33: Plug in relay 1 (pump relay).

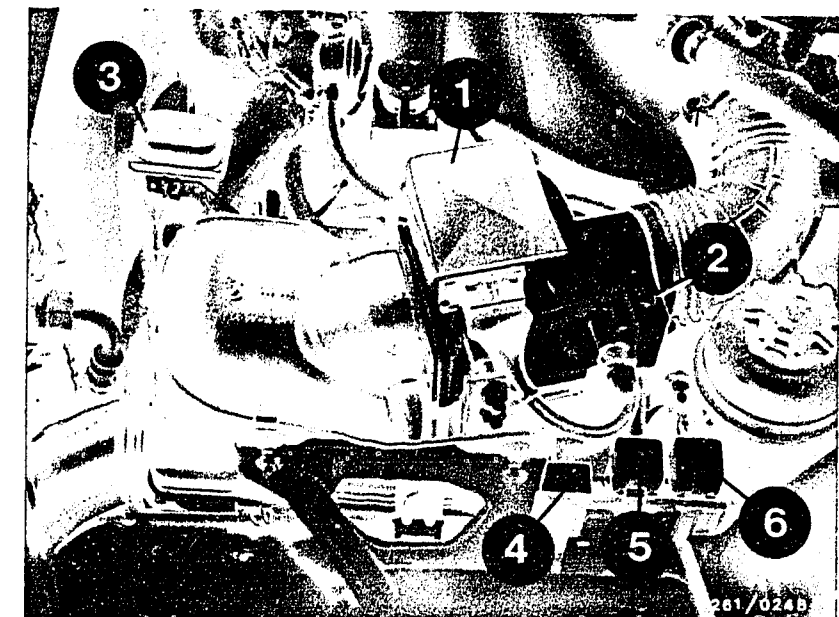
Operation		Reading	Testing
<u>Program switch "V"</u> in setting:	17	Voltmeter must read <u>10 ... 15 V</u>	<u>Component:</u> Relay 1 (pump relay)
<u>Program switch "Ω"</u> in setting:	15		
<u>Test equipment:</u> Voltmeter		<div><div>yes</div><div>no</div></div> <div>↓</div> <div>Continue test- ing with <u>next</u> test step.</div>	<u>Operation:</u> Voltage at Term. 20 to ground
<u>Scale:</u> 15 V			<u>Malfunction:</u> Voltage less than 10 V
<u>Connection:</u> Test sockets; (red = +, black = ground)	V		
<u>Operation in vehicle:</u> Switch ignition on			

Trouble-shooting:

- Take out and replace relay 1.
- Check the lead from control unit plug Term. 20 to relay 1 Term. 85.
- Take out and replace the control unit.

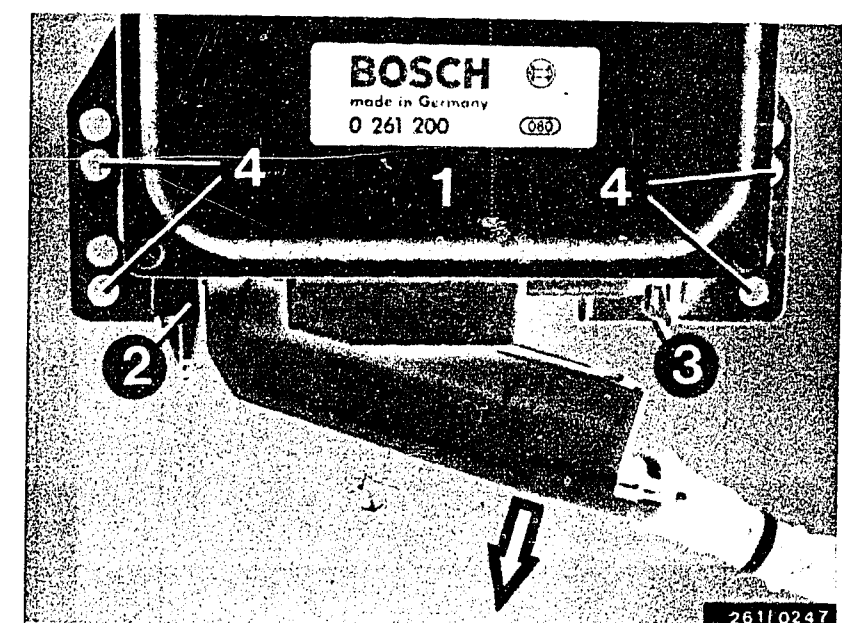
Note:

In order to preclude confusing the control units for the various systems one for the other, a mechanical encoding system has been introduced. The "lug" (pivot point for connecting and disconnecting the control unit) and the corresponding receptacle on the control unit have recesses or pins that fit one another.



- 4 = Relay 2 (main relay)
- 5 = Relay for sensor heater
- 6 = Relay 1 (pump relay)

- 1 = Control unit
- 2 = Lug
- 3 = Plug detent
- 4 = Fastening holes



F15

Testing with the universal test adapter
BMW 325e (USA)

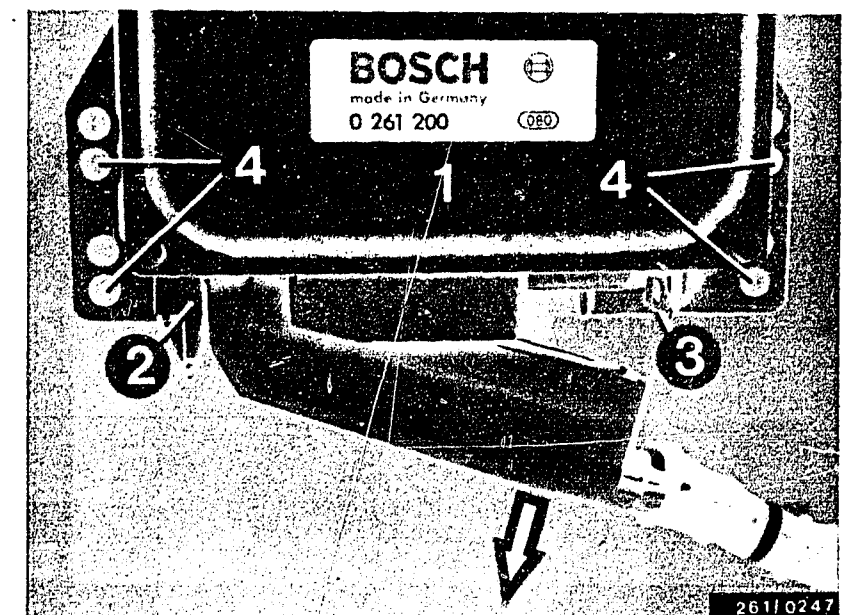


F16

Testing with the universal test adapter
BMW 325e (USA)



TEST STEP 34:			
Operation		Reading	Testing
Program switch "V" in setting:	17	Voltmeter must read <u>max. 4 V</u>	Component: Control unit
Program switch "Ω" in setting:	15		
Test equipment: Voltmeter		<div>yes</div> <div>↓</div> <div>Continue test- ing with <u>next</u> test step.</div> <div>no</div> <div>↓</div>	Operation: Pump control Term. 20 to ground
Scale: 15 V			
Connection: Test sockets; (red = +, black = ground)	V		Malfunction: Voltage greater than 4 V
Operation in vehicle: Shift into neutral and start the engine.			



- 1 = Control unit
- 2 = Lug
- 3 = Plug detent
- 4 = Fastening holes

Trouble-shooting:

Take out and replace the control unit.

Note:

In order to preclude confusing the control units for the various systems one for the other, a mechanical encoding system has been introduced. The "lug" (pivot point for connecting and disconnecting the control unit) and the corresponding receptacle on the control unit have recesses or pins that fit one another.

F17

Testing with the universal test adapter
BMW 325e (USA)

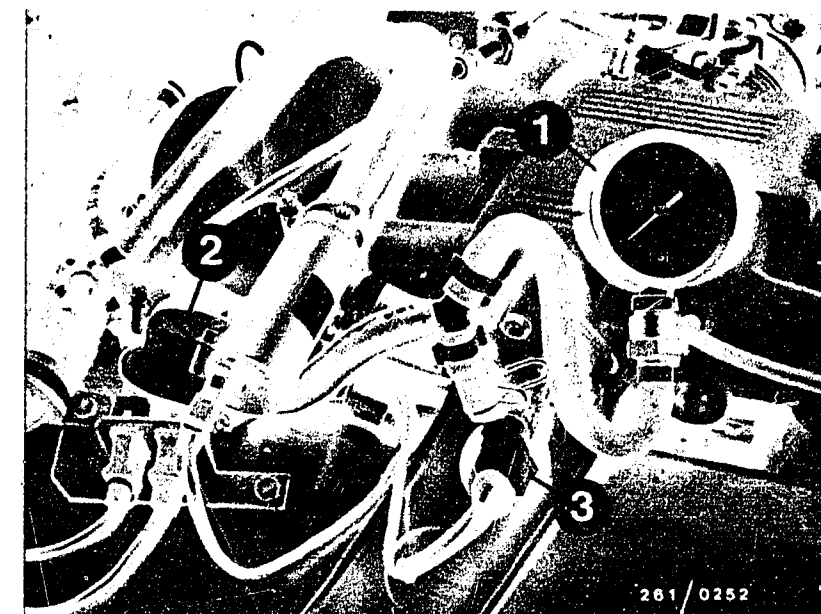


F18

Testing with the universal test adapter
BMW 325e (USA)



TEST STEP 35 Switch ignition off, connect pressure guage.		
Operation		Reading
Program switch "V" in setting:	17	2.3 to 2.7 bar
Program switch "Ω" in setting:	15	
Test equipment:		<div> <div>yes</div> <div>↓</div> <div>Continue test- ing with <u>next</u> test step.</div> </div> <div>no</div> <div>↓</div>
Pressure gauge		
Scale:		
0 to 6 bar		
Connection:		
In the fuel delivery line		
Operation in vehicle:		
Switch ignition on		
Button:		
Press T3		
		<div> <div>Component:</div> <div>Pump relay, fuel pump, pressure regulator, fuel filter</div> </div> <div> <div>Operation:</div> <div>Fuel pressure</div> </div> <div> <div>Malfunction:</div> <div>No fuel pressure or pressure not within tolerance</div> </div>

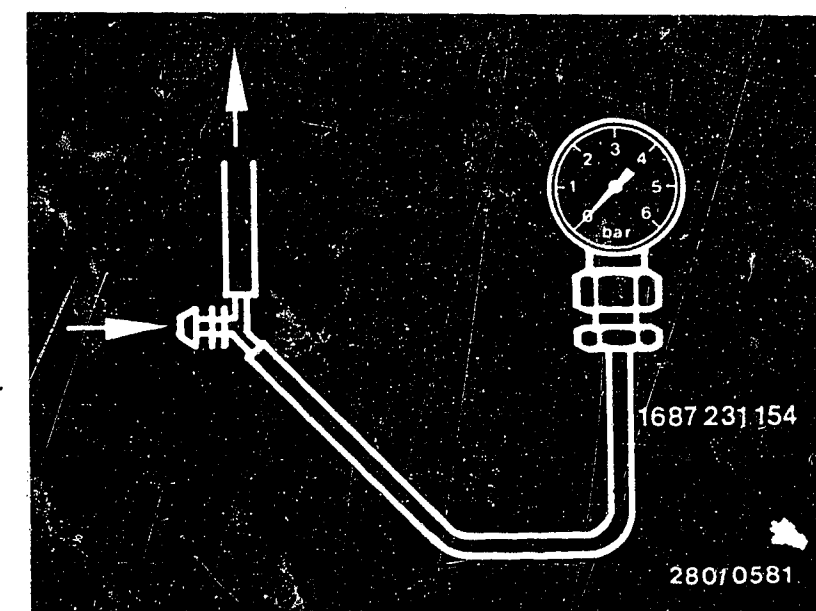


- 1 = Pressure gauge
- 2 = Fuel-line-pressure damper
in the fuel delivery line
- 3 = Start valve

Note:

Put the pressure gauge (1) into the fuel delivery line at the start valve (3). Catch any gasoline that runs out! Fire hazard with hot engine and electrical sparks!

Continued on F21/F22



F19

Testing with the universal test adapter
BMW 325e (USA)



F20

Testing with the universal test adapter
BMW 325e (USA)



TEST STEP 35, Continued

When using pressure tester KDJE-P 100, the valve screw must be screwed shut.

Make certain connections do not leak!

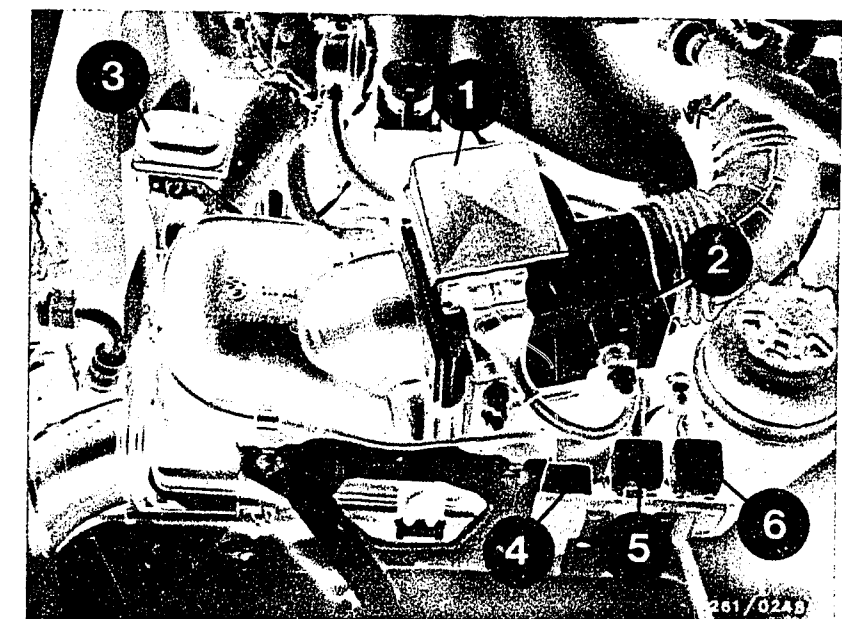
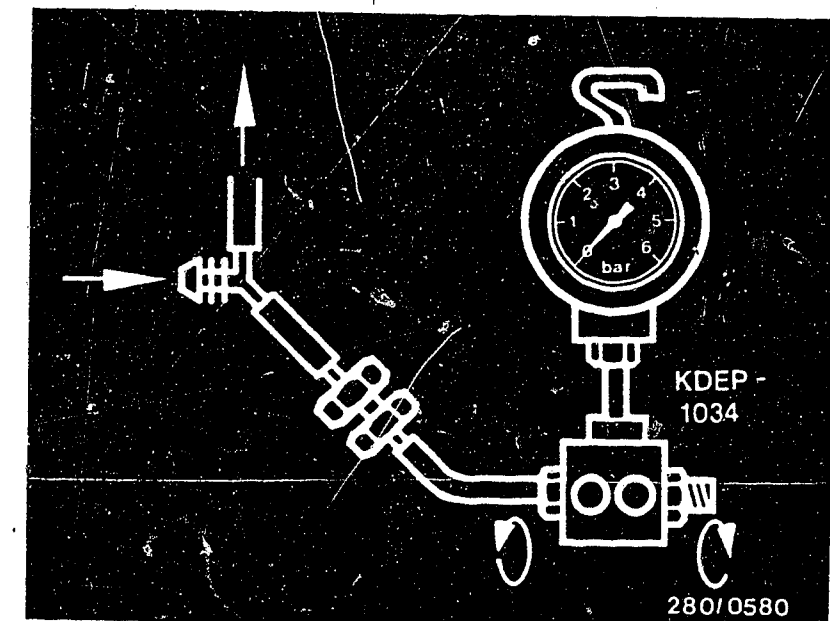
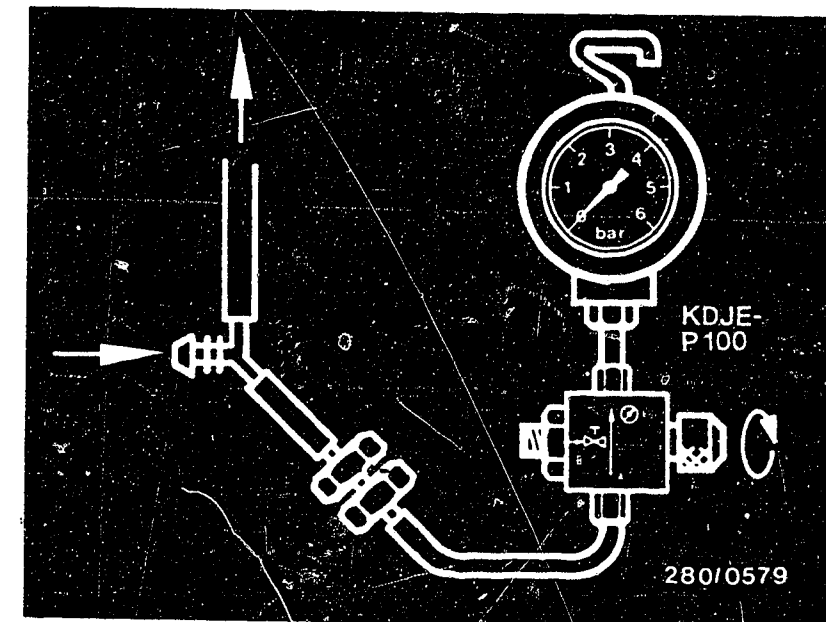
Switch ignition on. To measure pressure, press button T3.

Trouble-shooting, TEST STEP 35

1. Pressure 0 bar, no pump noises audible:

- Check pump fuse (No. 11 in the fuse box).
- Take out and replace relay 1 (pump relay) (6).

Continued on F23/F24



F21

Testing with the universal test adapter
BMW 325e (USA)



F22

Testing with the universal test adapter
BMW 325e (USA)



Trouble-shooting, TEST STEP 35 (continued)

- Disconnect pump plug and measure voltage on it.

If there is no voltage present:

Check the lead from the fuel pump to relay 2 Term. 87b and the pump ground lead.

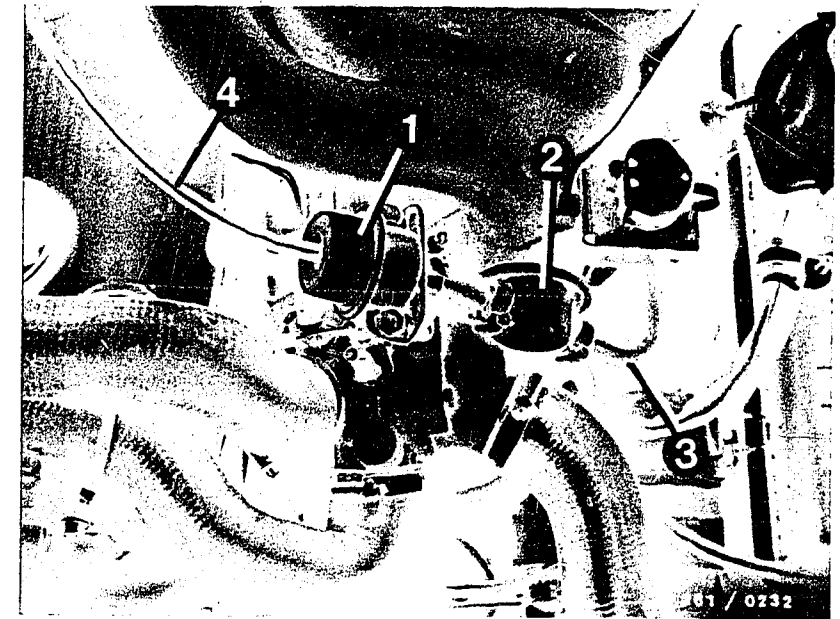
- If there is voltage present:
Check the pressure regulator and the fuel pump as described below in section 2.

2. Fuel pressure less than 2.3 bar, fuel pump is running:

- Fuel pressure too low:
Slowly pinch off the return line with a pinching clamp. If the pressure rises above 4 bar, take out and replace the pressure regulator.
If the pressure remains less than 4 bar, take out and replace the fuel pump.
- Check the fuel line and filter for open passage. Are the fuel lines pinched off?
- Is the tank filter clogged?
- Is there corrosion in the tank?

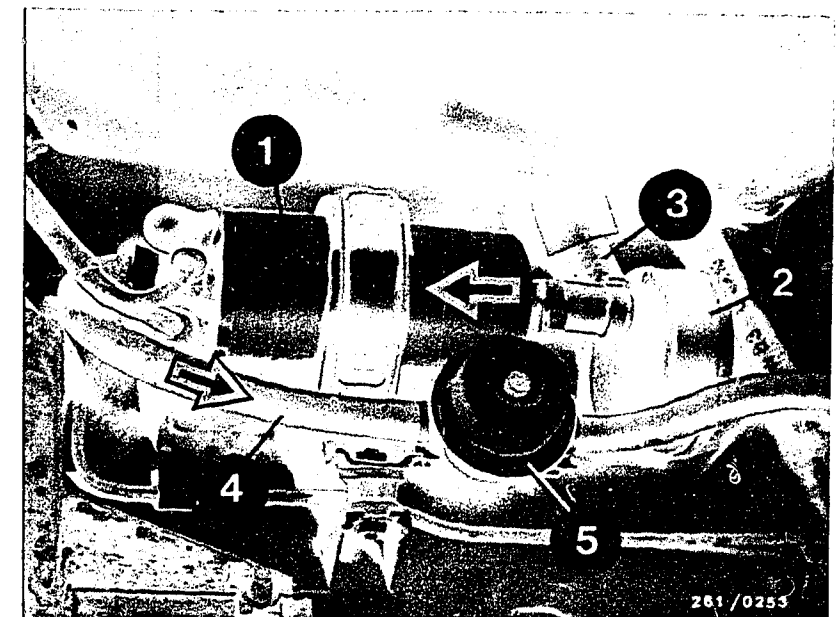
3. Fuel pressure greater than 2.7 bar:

- Fuel return line is clogged or pinched off.
- Take out and replace the pressure regulator.
The fuel pressure regulator is fastened to the fuel distribution pipe using two fastening screws and across an O-ring.
After the pressure regulator is take out, the O-ring and the flat ring must be replaced. (Use set of parts 1 287 010 704)



- 1 = Pressure regulator
- 2 = Fuel-line-pressure damper
- 3 = Fuel return hose
- 4 = Air hose to the intake manifold

- 1 = Electric fuel pump
 - 2 = Fuel spinner
 - 3 = Fuel intake line
 - 4 = Fuel delivery line
 - 5 = Fuel-line-pressure damper
- Arrows = Direction of through flow



F23

Testing with universal test adapter
BMW 325e (USA)



F24

Testing with universal test adapter
BMW 325e (USA)



N.B.!

The following test steps can be run only with the engine running. If the engine does not run, continue according to the trouble-shooting plan you have selected.

Detailed trouble-shooting, see C3-C4

Targeted trouble-shooting, see C5-C10.

For further trouble-shooting, leave the test adapter, control unit, and pressure gauge connected.

TEST STEP 36 (Connect motortester, diagnosis cable, and CO-tester before the catalytic converter.)

<u>Operation</u>		<u>Reading</u>	<u>Testing</u>
<u>Program switch "V"</u> in setting:	17	To test, switch loads off and disconnect the tank bleeder hose. 1. With engine at normal operating temperature: Idle speed: 650 ... 750 min -1 CO-level: 0.5 ... 0.8 vol. %CO 2. Press button T2: The values must remain unchanged!	<u>Component:</u> Idle speed control (LFR), engine, leaks in intake system
<u>Program switch "Ω"</u> in setting:	15		
<u>Test equipment:</u> Motortester and CO-tester			<u>Operation:</u> Idle speed and exhaust gas
<u>Scale:</u> Engine speed and CO			
<u>Connection:</u> Ignition coil, exhaust			<u>Malfunction:</u> Values not within tolerance
<u>Operation in vehicle:</u> Have engine run at normal operating temperature		<div>yes ↓ Continue testing with next test step.</div> <div>no ↓</div>	

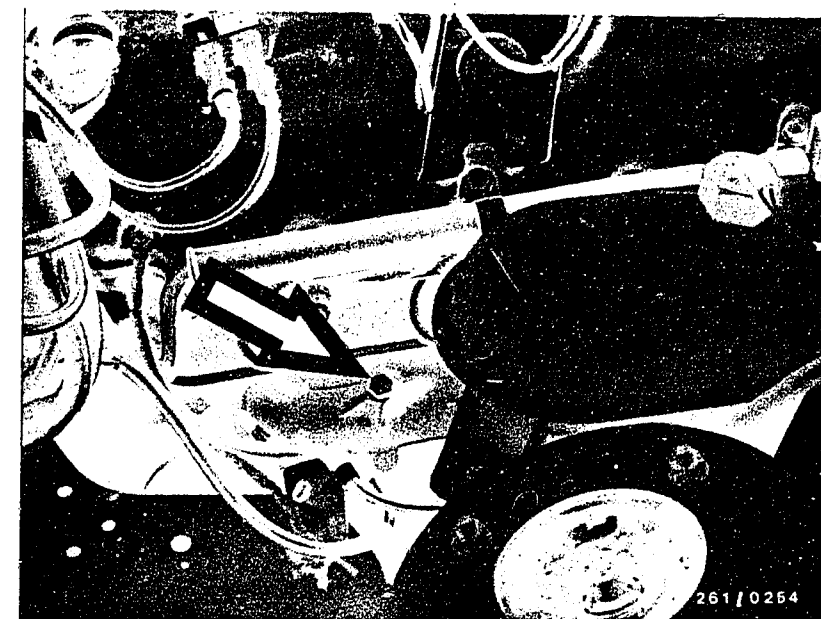
Trouble-shooting:

- Idle speed cannot be adjusted.

Idle speed control (VDO) is defective.

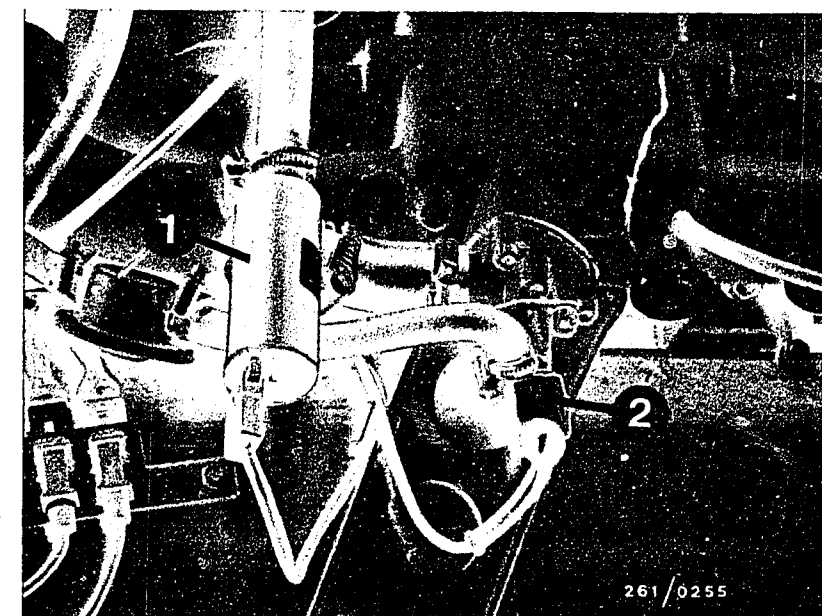
If the engine hunts, take out and replace the idle speed control control unit. Measure the coil resistance of the idle actuator.

Continued on G3



Arrow = CO-connection before the catalytic converter

1 = Idle actuator
2 = Start valve



G1

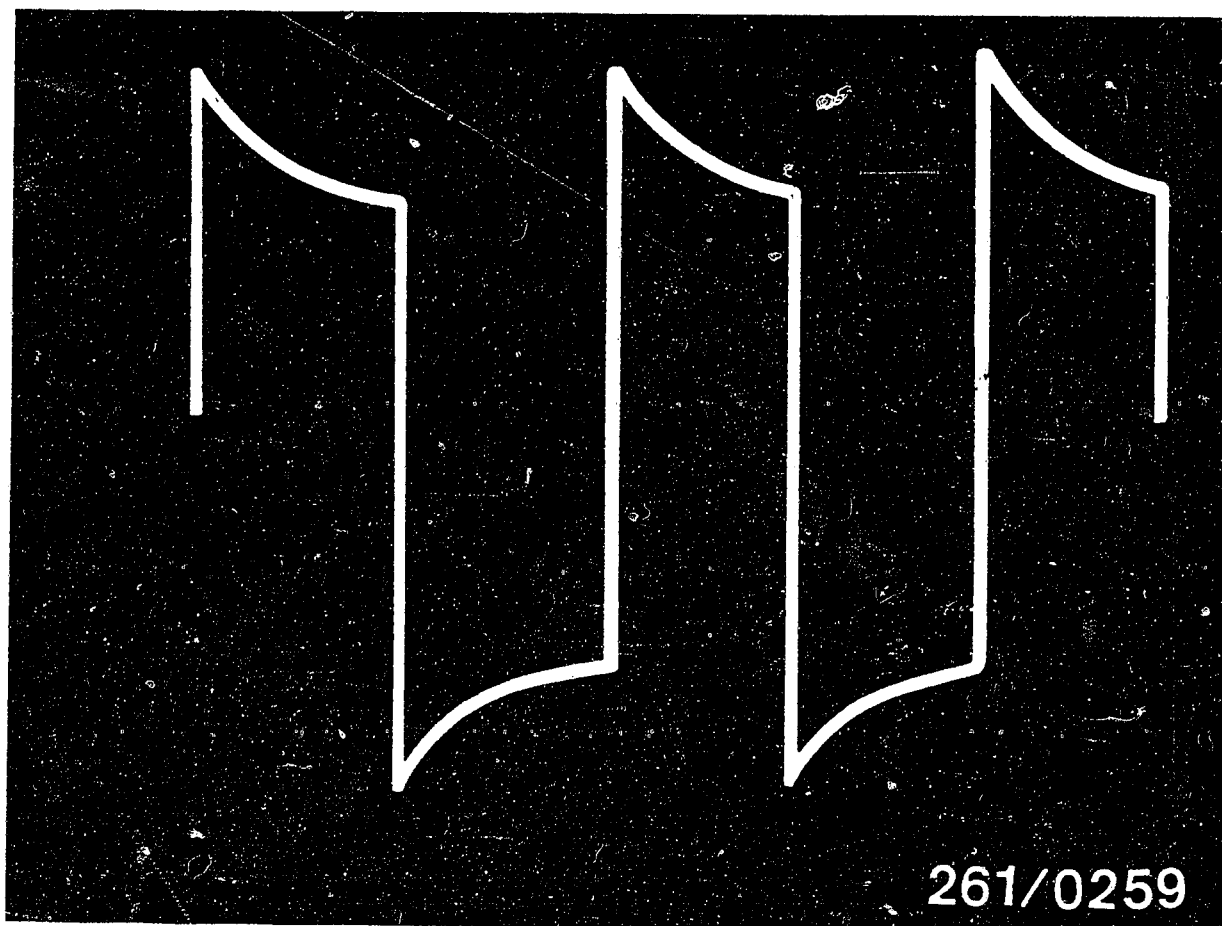
Testing with the universal test adapter
BMW 325e (USA)



G2

Testing with the universal test adapter
BMW 325e (USA)





Trouble-shooting, TEST STEP 36 (continued)

Measure pulses on the idle actuator.

At idle speed, the pattern shown above must appear on the oscilloscope.

If there are no pulses: check the power supply for the idle speed control control unit and/or take out and replace that control unit.

Further trouble-shooting: the actuator is mechanically defective.

Continued on G4/G5

G3

Testing with the universal test adapter
BMW 325e (USA)



Trouble-shooting, TEST STEP 36 (continued)

- Adjust the exhaust gas using the idle-mixture-adjusting screw (socket hex, AF 5) in the air-flow sensor. To do this, remove the plug in the air-flow sensor using the special tool. After completion of the adjustment, put in a new plug (red).

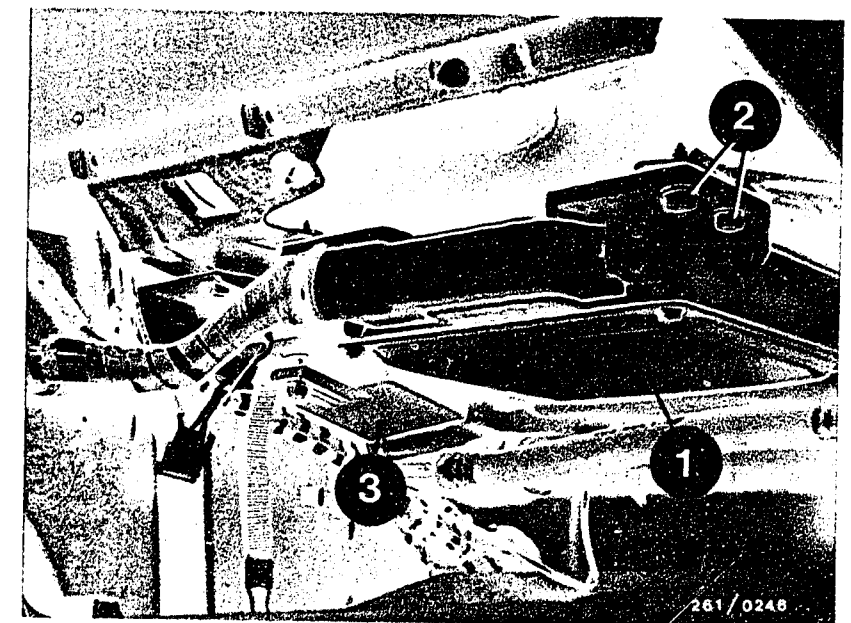
Turning the idle-mixture-adjusting screw clockwise increases the CO-level.

Turning the idle-mixture-adjusting screw counterclockwise reduces the CO-level.

If the exhaust gas value is less than 0.5 vol. %CO and can no longer be adjusted:
Check the intake end and the exhaust system for leaks (fresh air) by means of a hydrostatic test.

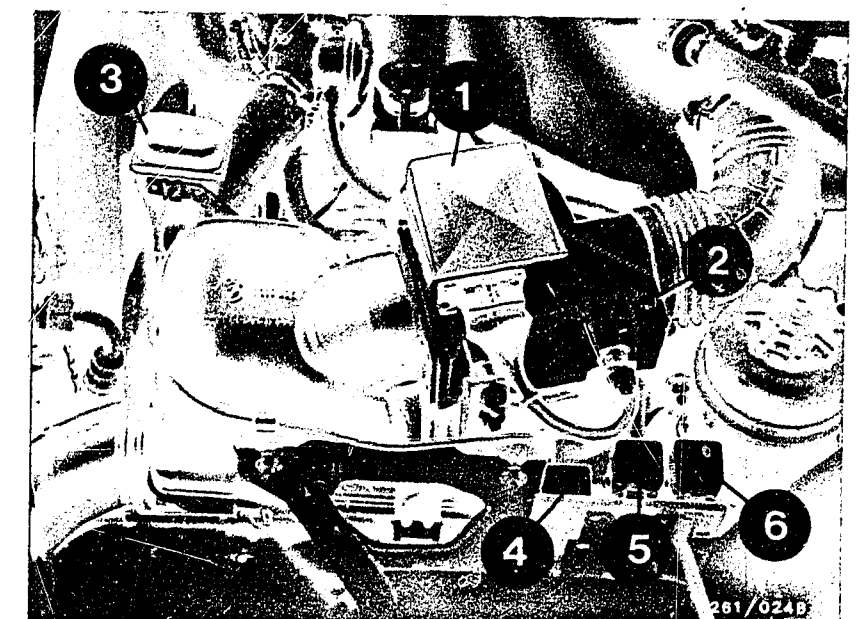
For 2.

If the values do not change when button T2 is pressed, the engine is not yet at normal operating temperature.



3 = Control unit for idle speed control

1 = Air-flow sensor with NTC I
2 = Idle-mixture-adjusting screw



G4

Testing with the universal test adapter
BMW 325e (USA)

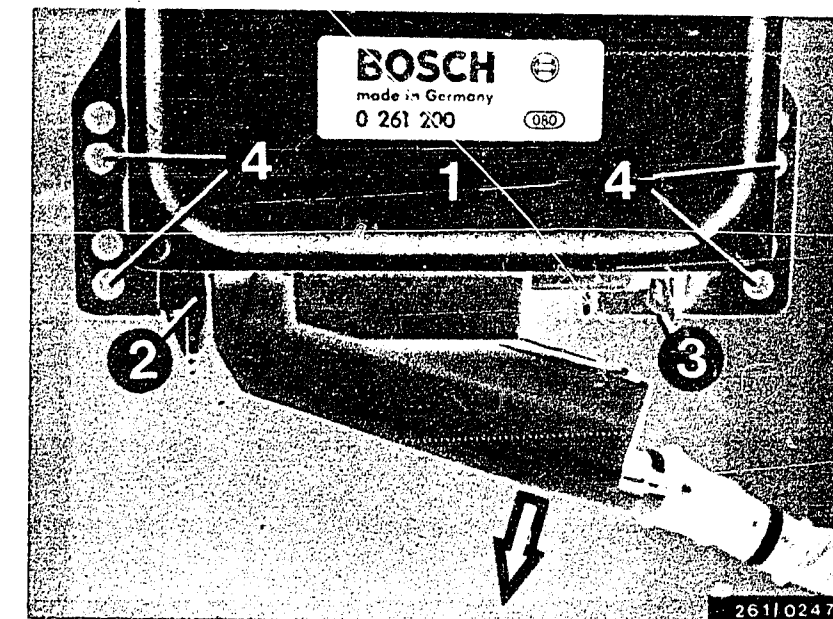


G5

Testing with the universal test adapter
BMW 325e (USA)



TEST STEP 37			
Operation		Reading	Testing
Program switch "V" in setting:	17	1. With engine at normal operating temperature and idle speed: $3^{\circ} \dots 13^{\circ}$ <u>Note:</u> If the idle speed fluctuates, the timing angle also fluctuates. 2. Press button T6 (full load) and increase engine speed to 2700 min ⁻¹ . <u>Timing angle $9^{\circ} \dots 15^{\circ}$</u> To test, cool the engine with an auxiliary fan, because the timing angle is pulled back as the air intake temperature increases (starting from $+30^{\circ} \text{C}$).	Component: Control unit
Program switch "Ω" in setting:	15		
Test equipment: Motortester			Operation: Timing angle at idle and full load
Scale: Timing angle			Malfunction: Timing angle not within tolerance
Connection: Diagnosis cable			
Operation in vehicle: Have engine run at normal operating temperature			



- 1 = Control unit
- 2 = Lug
- 3 = Plug detent
- 4 = Fastening holes

Trouble-shooting:

- For 1: recheck the idle speed exactly, and repeat the test step. The idle speed must be between 650 and 750 min⁻¹ or the readings for timing angle will be different!
- For 2: Run up the engine speed again and take another reading for timing angle. Switch the auxiliary fan on!
- Take out and replace the control unit.

Note:

In order to preclude confusing the control units for the various systems one for the other, a mechanical encoding system has been introduced. The "lug" (pivot point for connecting and disconnecting the control unit) and the corresponding receptacle on the control unit have recesses or pins that fit one another.

G6

Testing with universal test adapter
BMW 325e (USA)



G7

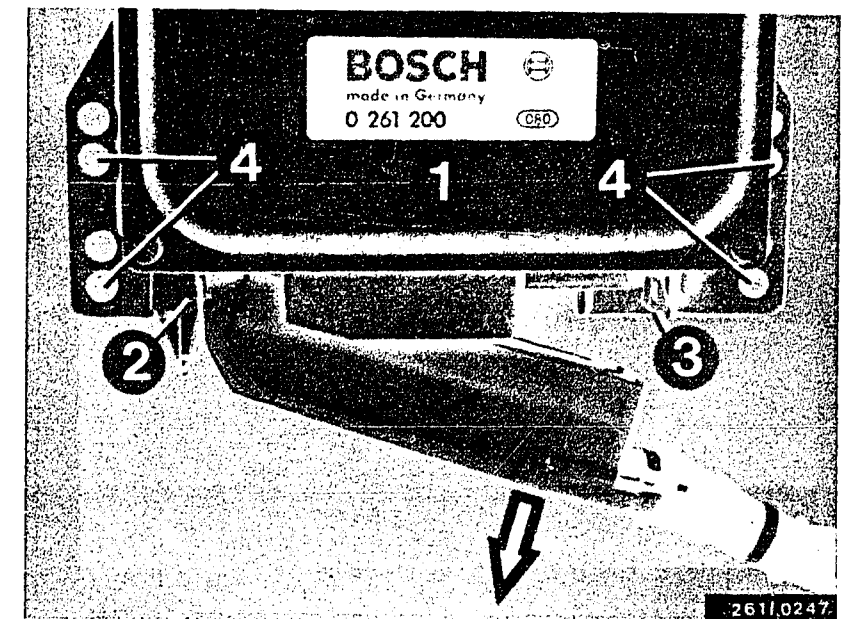
Testing with universal test adapter
BMW 325e (USA)



Operation		Reading	Testing
<u>Program switch "V"</u> in setting:	17	1. With engine at normal operating temperature and at idle speed: <u>6° ... 18°</u> 2. At 3000 min ⁻¹ <u>22° ... 42°</u>	<u>Component:</u> Control unit
<u>Program switch "Ω"</u> in setting:	15		
<u>Test equipment:</u> Motortester			<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> yes ↓ </div> <div style="text-align: center;"> no ↓ </div> </div>
<u>Scale:</u> Dwell angle		<u>Malfunction:</u> Dwell angle not within tolerance	
<u>Connection:</u> Ignition coil			
<u>Operation in vehicle:</u> Have engine run			

Take out and replace the control unit.

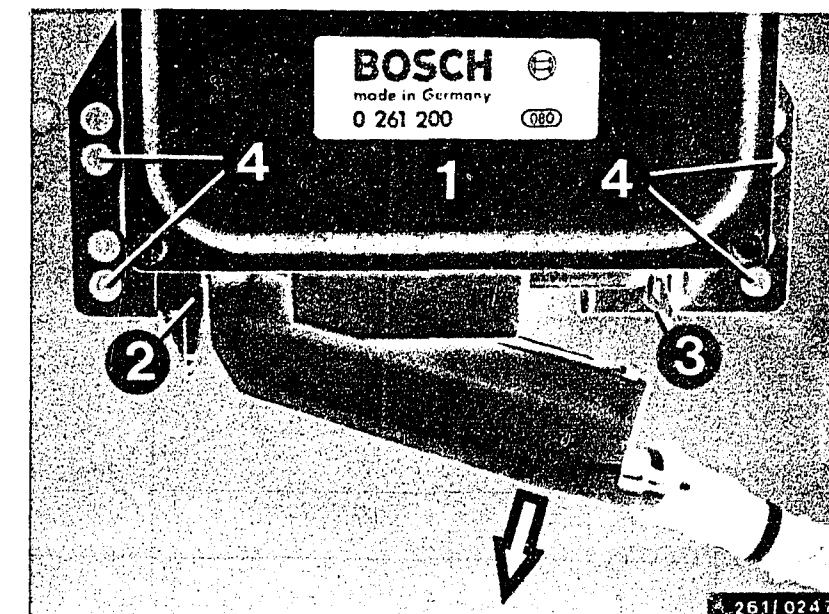
In order to preclude confusing the control units for the various systems one for the other, a mechanical encoding system has been introduced. The "lug" (pivot point for connecting and disconnecting the control unit) and the corresponding receptacle on the control unit have recesses or pins that fit one another.



- 1 = Control unit
- 2 = Lug
- 3 = Plug detent
- 4 = Fastening holes



TEST STEP 39			
Operation		Reading	Testing
<u>Program switch "V"</u> <u>in setting:</u>	17	Engine at normal operating temperature. Engine speed 2000 min ⁻¹ . (Keep the same setting for the accelerator pedal.) Press button T5: <u>Engine "hunts,"</u>	<u>Component:</u> Control unit
<u>Program switch "Ω"</u> <u>in setting:</u>	15		
<u>Test equipment:</u> Motortester		i.e., engine speed drops off and then increases again. (Fuel-injection signal disappear and then reappear at approx. 900 ... 1200 min ⁻¹ .) The fluctuations in engine speed remain as long as <u>button T5 is pressed.</u>	<u>Operation:</u> Cutoff of the fuel-injection signals (overrun cutoff)
<u>Scale:</u> Engine speed			
<u>Connection:</u> Ignition coil			
<u>Operation in vehicle:</u> Have engine run			
<u>Button:</u> Press T5		yes ↓	<u>Malfunction:</u> No cutoff
		no ↓	
		Continue test- ing with <u>test</u> <u>step 42.</u> (<u>Test</u> <u>steps 40 and 41</u> <u>are not used.</u>)	



- 1 = Control unit
- 2 = Lug
- 3 = Plug detent
- 4 = Fastening holes

Trouble-shooting:

Take out and replace the control unit.

Note:

In order to preclude confusing the control units for the various systems one for the other, a mechanical encoding system has been introduced. The "lug" (pivot point for connecting and disconnecting the control unit) and the corresponding receptacle on the control unit have recesses or pins that fit one another.

G10

Testing with universal test adapter
BMW 325e (USA)

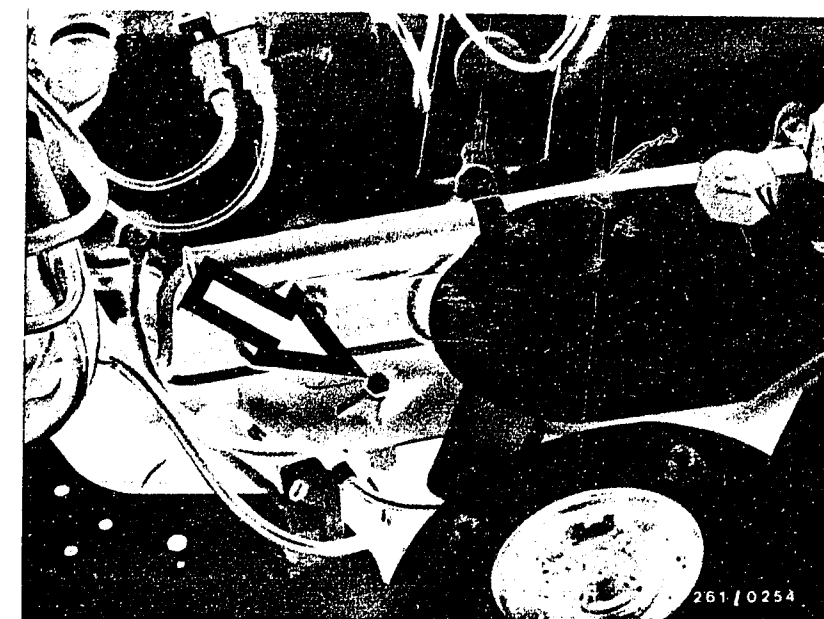


G11

Testing with universal test adapter
BMW 325e (USA)



Test steps 40 and 41 are not used.		
TEST STEP 42 Disconnect the tank bleeder hose. Connect the CO-tester in front of the catalytic converter.		
<u>Operation</u>		<u>Reading</u>
<u>Program switch "V" in setting:</u>	20	CO rises above 3.5 vol. %.
<u>Program switch "Ω" in setting:</u>	22	
<u>Test equipment:</u> CO-tester		After approx. 10 sec., the CO-level drops back off.
<u>Scale:</u> 10 vol. %		
<u>Connection:</u> On the test fixture		yes ↓ Continue testing with <u>next test step.</u>
<u>Operation in vehicle:</u> Have engine run at normal operating temperature		
		no ↓
		<u>Testing</u> <u>Component:</u> Control unit <u>Function:</u> Lambda closed-loop control, upper limit of closed-loop control ("rich" stop), Term. 24 to ground <u>Malfunction:</u> CO unchanged



Arrow = Co-connection in front of catalytic converter

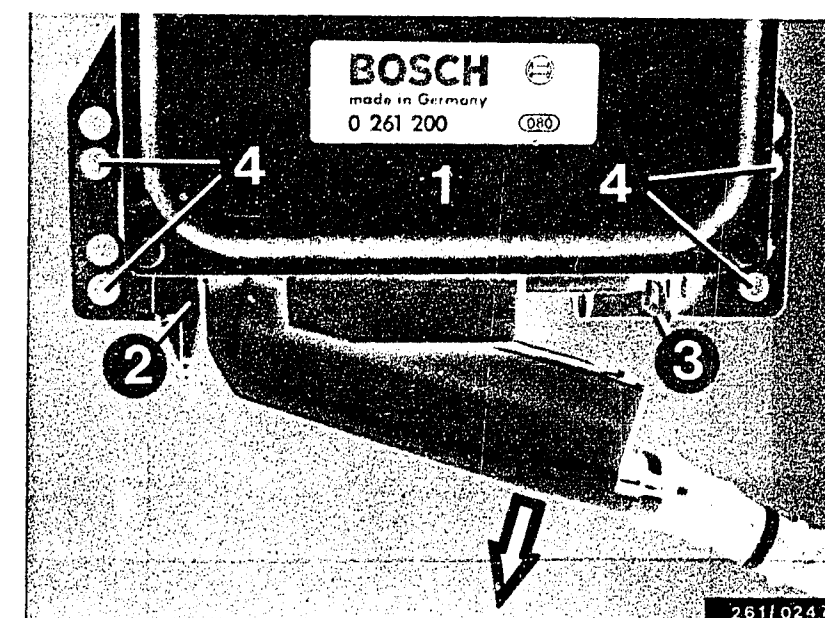
- 1 = Control unit
- 2 = Lug
- 3 = Plug detent
- 4 = Fastening holes

Trouble-shooting:

Take out and replace the control unit.

Note:

In order to preclude confusing the control units for the various systems one for the other, a mechanical encoding system has been introduced. The "lug" (pivot point for connecting and disconnecting the control unit) and the corresponding receptacle on the control unit have recesses or pins that fit one another.



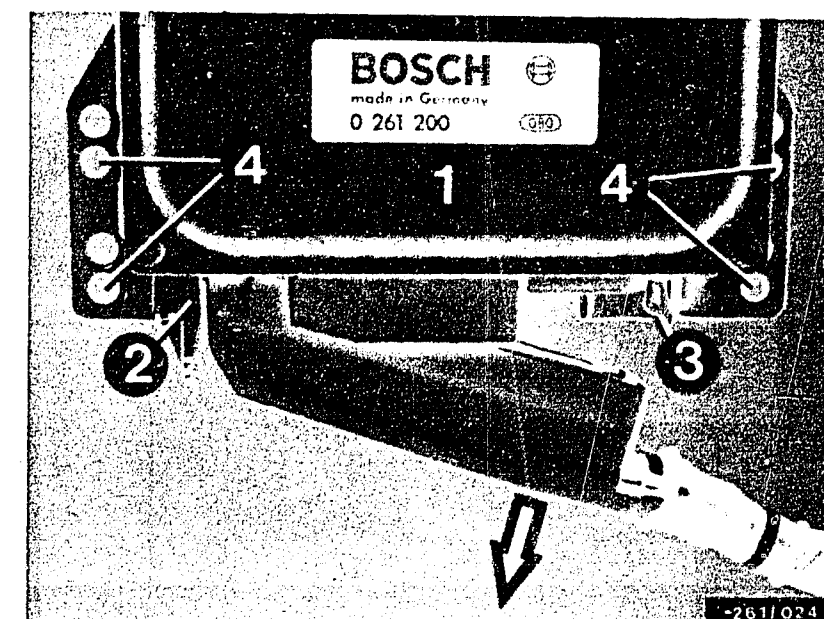
TEST STEP 43			
Operation		Reading	Testing
Program switch "V" in setting:	20	CO drops below 0.5 vol. %.	Component: Control unit
Program switch "Ω" in setting:	23	Engine runs rough. After approx. 10 sec., CO-level rises again.	
Test equipment: Co-tester		<div>yes</div> <div>no</div>	Operation: Lambda closed-loop control, lower limit for closed-loop control ("lean" stop), Term. 24 to + 2 V
Scale: 2.5 vol. %			Malfunction: CO-level unchanged
Connection: On the test fixture			
Operation in vehicle: Have engine run			

Trouble-shooting:

Take out and replace the control unit.

Note:

In order to preclude confusing the control units for the various systems one for the other, a mechanical encoding system has been introduced. The "lug" (pivot point for connecting and disconnecting the control unit) and the corresponding receptacle on the control unit have recesses or pins that fit one another.



- 1 = Control unit
- 2 = Lug
- 3 = Plug detent
- 4 = Fastening holes

G14

Testing with universal test adapter
BMW 325e (USA)



G15

Testing with universal test adapter
BMW 325e (USA)



TEST STEP 44

Operation

Program switch "V"
in setting:

20

Program switch "Ω"
in setting:

24

Test equipment:
CO-tester

Scale:
2.5 vol. %

Connection:
On the test fixture

Operation in vehicle:
Have the engine run

Reading

0.5 to 0.8 vol. %

After completion of the
test, reconnect the
tank bleeder hose.

Testing

Component:
Lambda sensor

Operation:
Lambda closed-loop control,
Term. 24 connected to
lambda sensor.

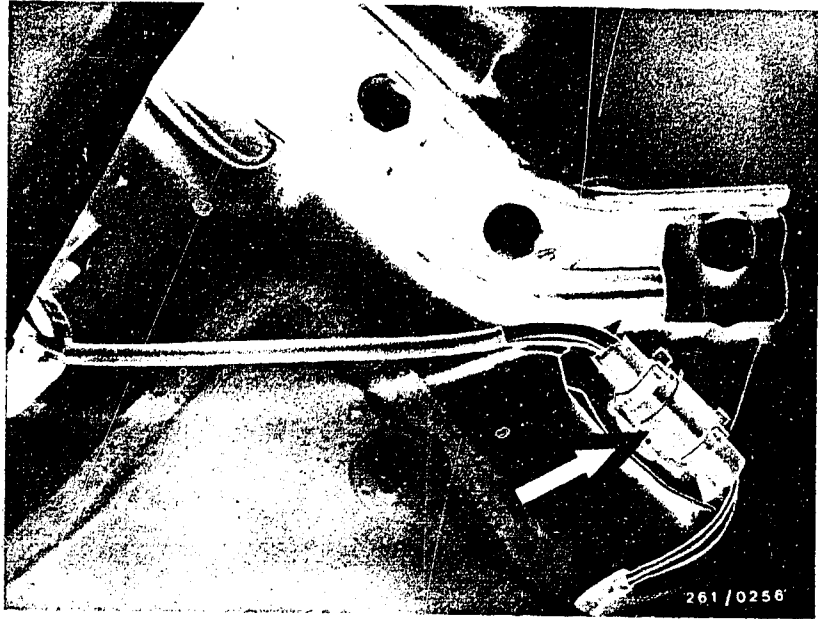
Malfunction:
CO-level not within tolerance

Trouble-shooting:

1. Take out and replace the lambda sensor.

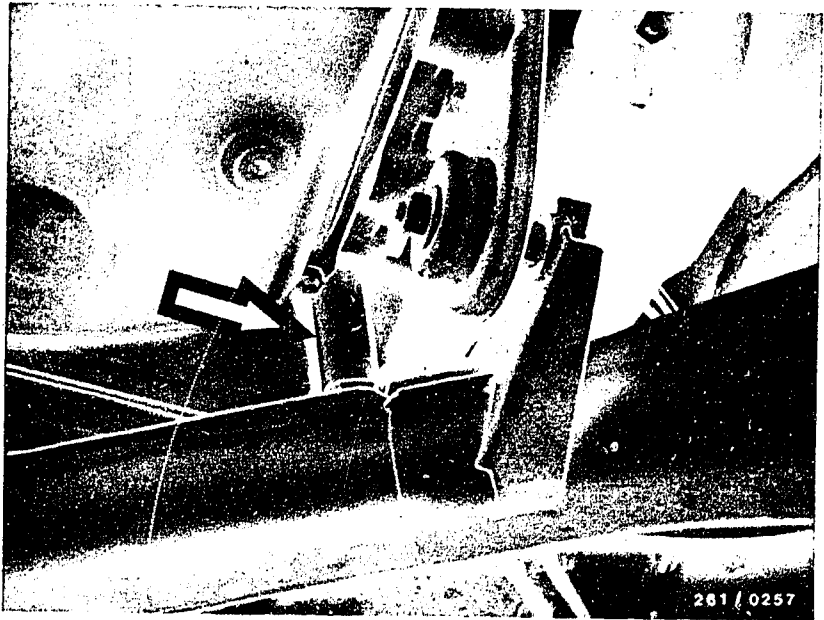
When replacing the sensor, coat its thread with the special mounting paste VS 14016 Ft (5 964 080 105). Make certain that only threads are filled and that no paste gets into the slits. If need be, clean the plug connection for the sensor lead before taking it apart. When plugging back in, do not get any dirt into the plug, and make certain it is properly latched.

2. If 1. is not successful, take out and replace the control unit.



Arrow = Plug connection of lambda sensor

Arrow = Lambda sensor



G16

Testing with universal test adapter
BMW 325e (USA)



G17

Testing with universal test adapter
BMW 325e (USA)



Testing with the universal test adapter has been completed. If the defect has not been found or if additional instructions are needed for correction of the defect, proceed according to the trouble-shooting plan you selected.

Detailed trouble-shooting: ➤ C3 - C4
Targeted trouble-shooting: ➤ C5 - C 10



STARTING MOTOR TURNS, ENGINE DOES NOT START OR STARTS ONLY WITH DIFFICULTY

Trouble-shooting program according to customer complaint

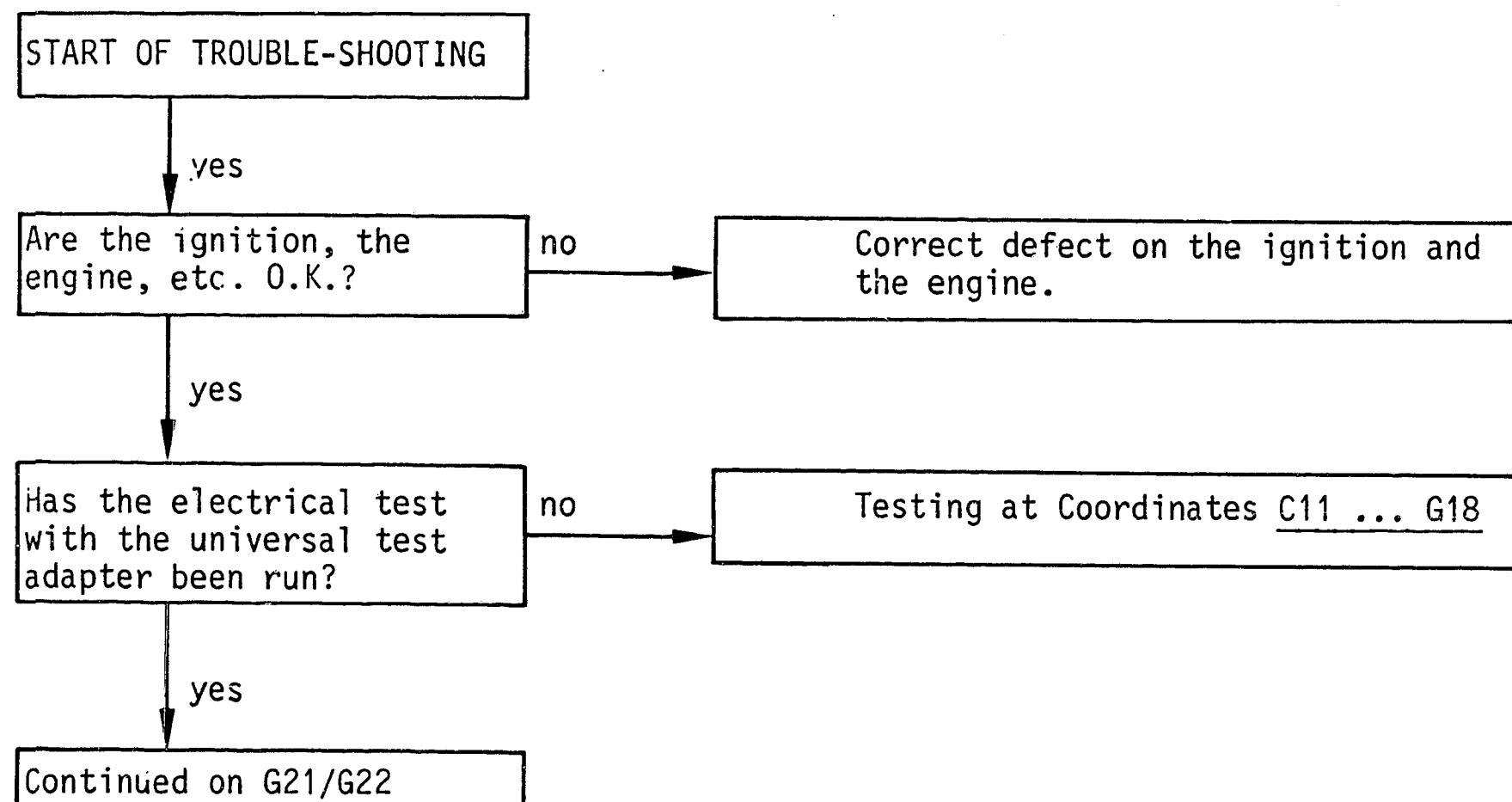
How to use the program

Testing is organized into 3 columns of boxes:

- In the column at the left are the questions for the texts being run.
- In the column in the center the component tests and settings are described.
- The column at the right shows the figures belonging to the text and the legend for the figures.

If it is possible to answer the questions clearly with "yes" even without testing, proceed to the next question below.

On the other hand, if the answer to the question is "no", and a defect is suspected, you must switch to the center column of boxes and carry through the tests indicated there. At the end of the test, the trouble shooting is continued at that point at which the shift was made previously.



G 19

Engine does not start
BMW 325e (USA)



G 20

Engine does not start
BMW 325e (USA)



Starting motor turns, engine does not start or starts only with difficulty (continued)

yes

Check the secondary pattern for all cylinders at starting speed. Is the secondary pattern O.K.?

no

Check the ignition coil and the high voltage portion: is the distributor cap covered with oil on the outside and inside? (Unscrew the distributor rotor and check the camshaft seal).

Notes:

Distributor cap is fastened with 3 screws. To remove the distributor cap the cover of the radiator must be removed. When putting the ignition leads on, watch the cylinder numbers! Do not forget the cover and shielding cap! Check the primary ignition coil for continuity (approx. 0Ω). Secondary coil resistance: 5 to $7.2k\Omega$. Check the interference suppression resistors, the ignition leads, and the spark plugs.

Interference suppression resistance in

Ignition distributor rotor:	1 $k\Omega$
Ignition distributor housings: each	1 $k\Omega$
Spark-plug connectors: each	5 $k\Omega$
Spark plugs:	5 $k\Omega$
Ignition coil:	1 $k\Omega$

yes

During the starting process, feel all solenoid-operated fuel-injection valves by hand. Is the movement of the needle perceptible in each of them?

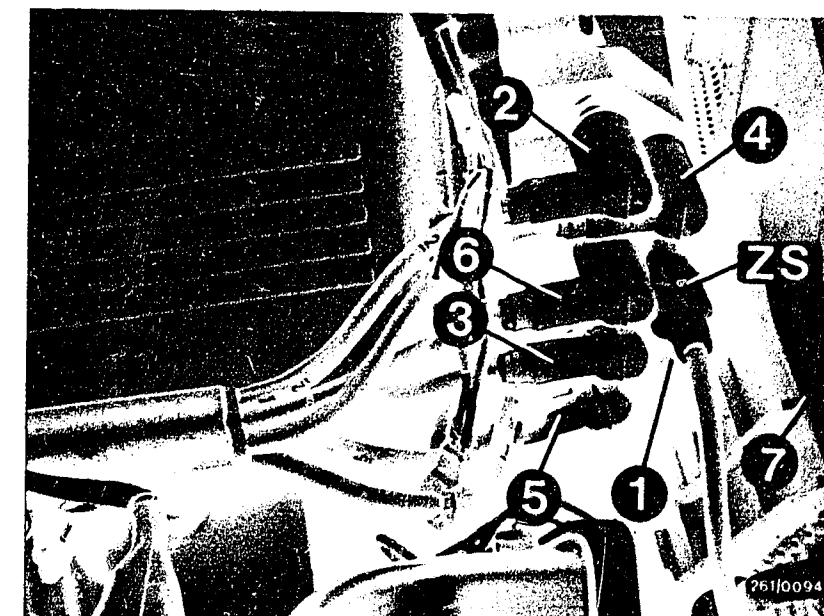
no

Check the solenoid-operated fuel-injection valve with an ohmmeter.
Test specification: 2 ... 3Ω
If need be, take up and replace a defective solenoid-operated fuel-injection valve

yes

Continued on H3/H4

Continued on G23/G24



High voltage distributor

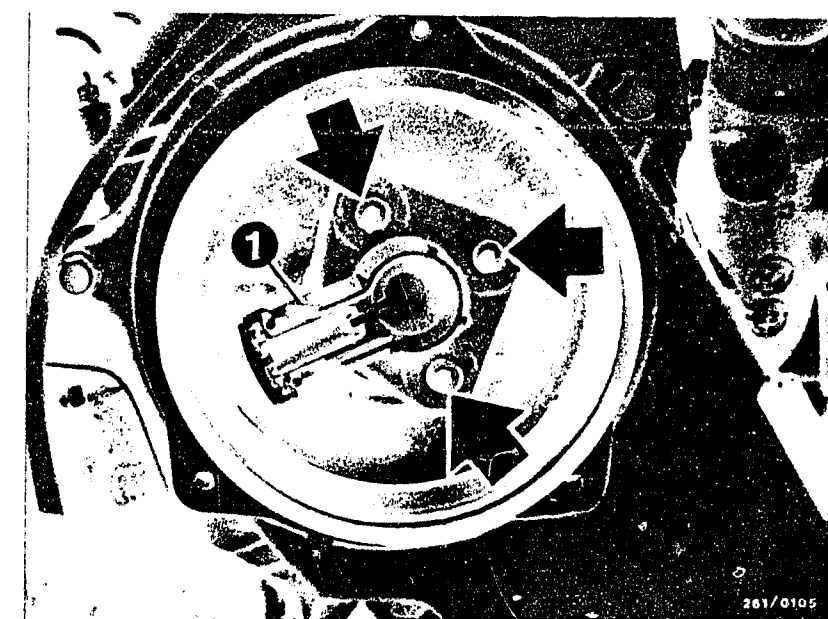
1 - 6 = Cylinder numbers

ZS = High voltage lead to the ignition coil

7 = Radiator cover

1 = Distributor rotor

Arrow = Fastening screws



G21

Engine does not start
BMW 325e (USA)



G22

Engine does not start
BMW 325e (USA)



Starting motor turns, engine does not start or starts only with difficulty (continued)

yes

Taking out the solenoid-operated fuel-injection valves

Release the fastening screws on the fuel distribution pipe. Pull the fuel distribution pipe up until the solenoid-operated fuel-injection valves are out of the hole in the intake manifold. Do not damage the nozzle needle or the rubber gasket.

Check the nozzle needles and the area around them for tightness of seal and for dirt deposits.

Disconnect the electrical connection.

Carefully shove the holding bracket out of the slot and pull the solenoid-operated fuel-injection valve out of the fuel distribution pipe connection.

Caution!

Catch any fuel that runs out. Do not allow it to drip on hot portions of the engine. Fire hazard!

Caution!

The protection sleeve must not be pried off.

Installation of the solenoid-operated fuel-injection valves.

Take out and replace damaged or swollen O-rings. Use set of parts 1 287 010 704.

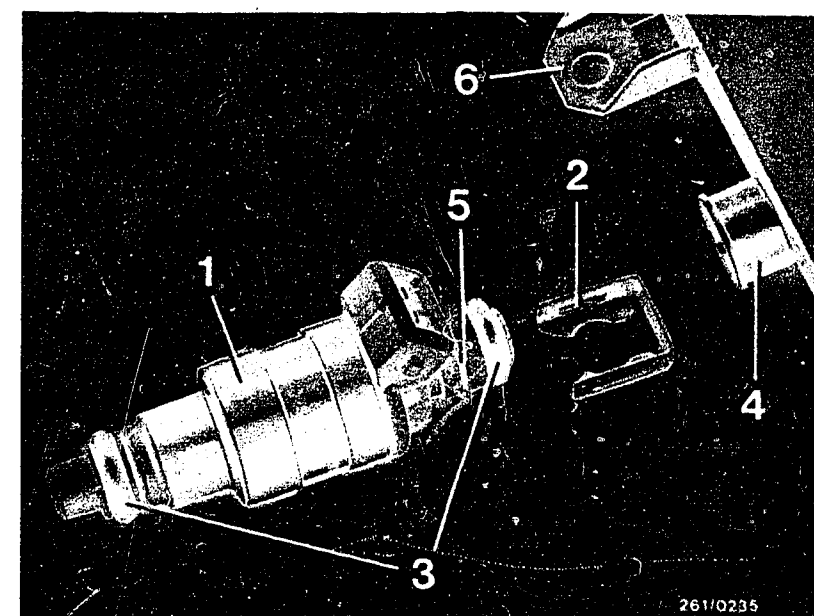
Cut the lower O-ring (intake tube) into pieces.

Caution! Do not damage the protection sleeve.

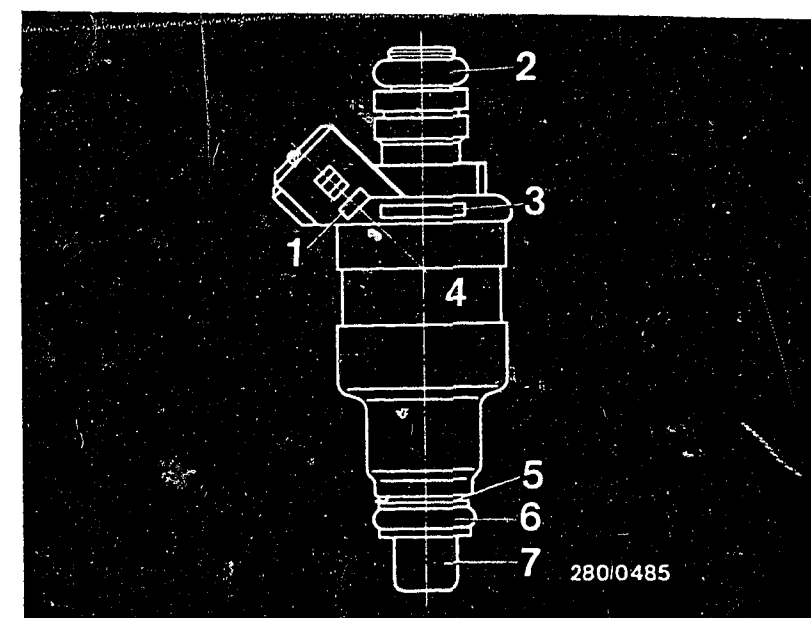
Pull a new O-ring over the protection sleeve and the shoulder on it. Do not damage any parts in so doing.

Continued on H3/H4

Continued on H1/H2



- 1 = Solenoid-operated fuel-injection valve
- 2 = Holding bracket
- 3 = Rubber gasket
- 4 = Fuel distribution pipe connection
- 5 = Slot
- 6 = Fastening tab



G23

Engine does not start
BMW 325e (USA)



G24

Engine does not start
BMW 325e (USA)



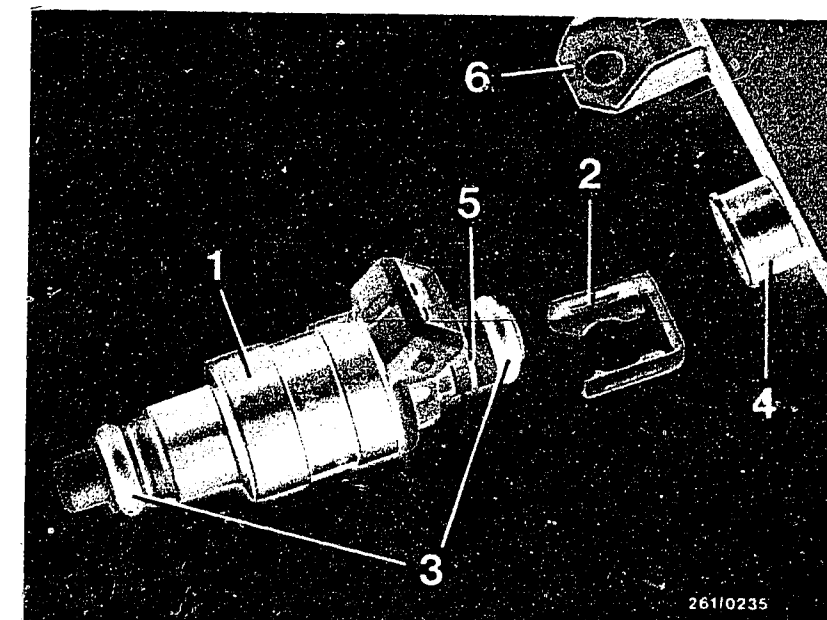
Starting motor turns, engine does not start or starts only with difficulty (continued)

yes

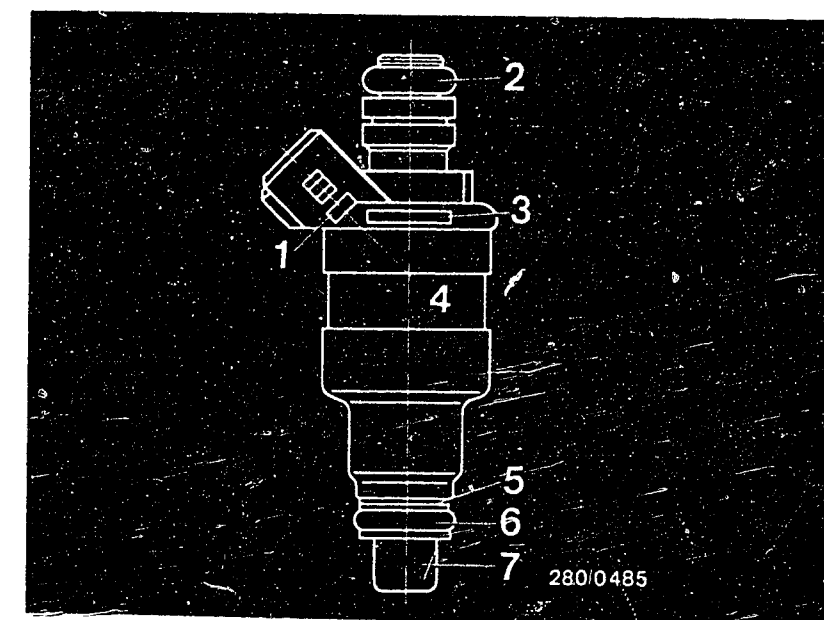
Before installation, check both rubber gaskets for proper seating. Fasten the solenoid-operated fuel-injection valves to the fuel distribution pipe. All solenoid-operated fuel-injection valves are to be pressed into the seats at the same time using the fuel distribution pipe. Screw the fuel distribution pipe tight. Check all air and fuel hoses for proper seating. Make electrical connections.

Start the engine and check that no unmetered air is being drawn in.

Continued on H3/H4



- 1 = Solenoid-operated fuel-injection valve
- 2 = Holding bracket
- 3 = Rubber gasket
- 4 = Fuel distribution pipe connection
- 5 = Slot
- 6 = Fastening tab
- 7 = Top O-ring
- 6 = Bottom O-ring
- 7 = Protection sleeve



H1

Engine does not start
BMW 325e (USA)



H2

Engine does not start
BMW 325e (USA)



Starting motor turns, engine does not start or starts only with difficulty (continued)

yes

Is the idle speed control
(from VDO) O.K.?

no

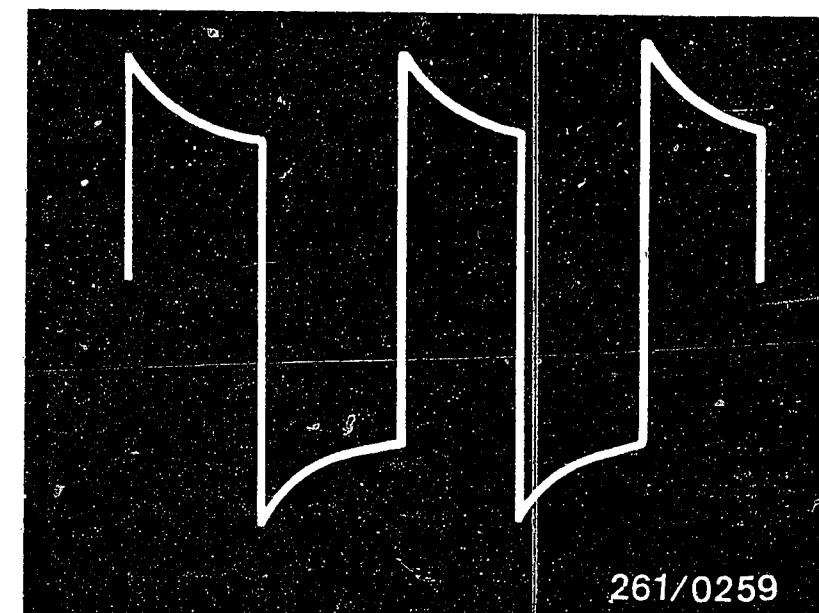
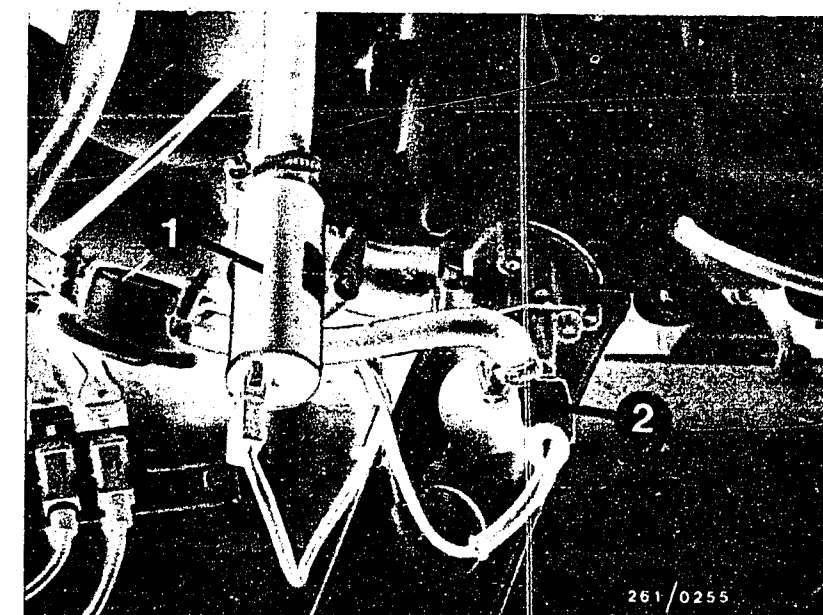
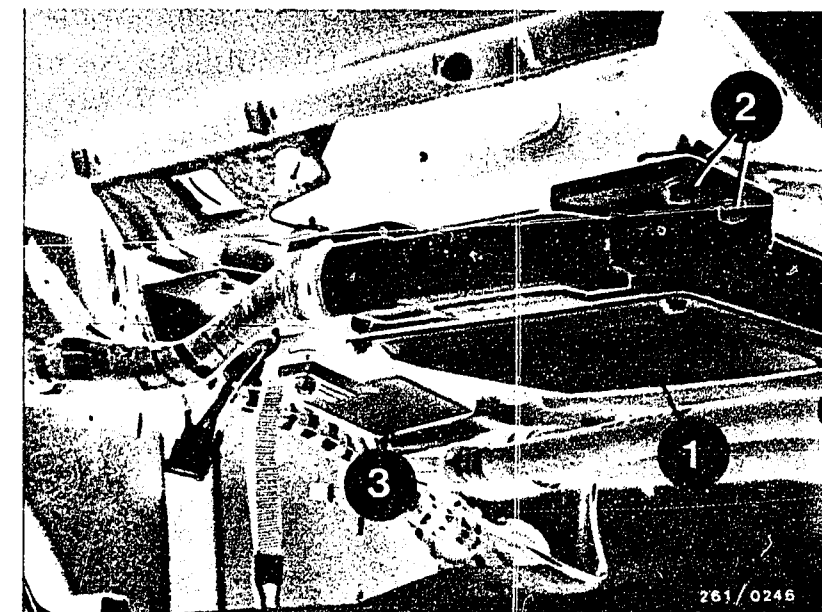
If the engine hunts, take out and replace the idle speed control control unit (Figure at the top - Item 3). Measure the coil resistance of the idle actuator (Figure at the center - Item 1): if there is a break or if the reading is 0Ω , the actuator is defective.

Measure the pulses on the actuator plug.
Pulses must be visible on the oscilloscope at idle speed (Figure at the bottom). If there are no pulses: examine the power supply for the idle speed control control unit and/or take out and replace the idle speed control control unit.

Additional cause of defects:
The actuator is mechanically defective.

yes

Continued on H5/H6



H3

Engine does not start
BMW 325e (USA)



H4

Engine does not start
BMW 325e (USA)



Starting motor turns, engine does not start or starts only with difficulty (continued)

yes

Is the start valve O.K.?

no

Functional test: Check the voltage supply for the start valve at start. To do so, disconnect the plug of the start valve and connect a voltmeter to Term. 73 and Term. 75/Term. 76 of the start valve plug: Reading for voltage min. 6 V, if the coolant temperature is less than $+30^{\circ}\text{C}$ (with thermotime switch $35^{\circ} / 8\text{ s}$).

Coolant with engine at normal operating temperature (approx. $+80^{\circ}\text{C}$):
Reading for voltage approx. 0 V.

Check the following leads with an ohmmeter for continuity (specified value approx. $0\ \Omega$):

- Lead from start valve Term. 73 to the thermotime switch Term. W
- Lead from the start valve Term. 75/76 to the thermotime switch Term. G
- Lead from the start valve Term. 75/76 to the starting motor Term. 50

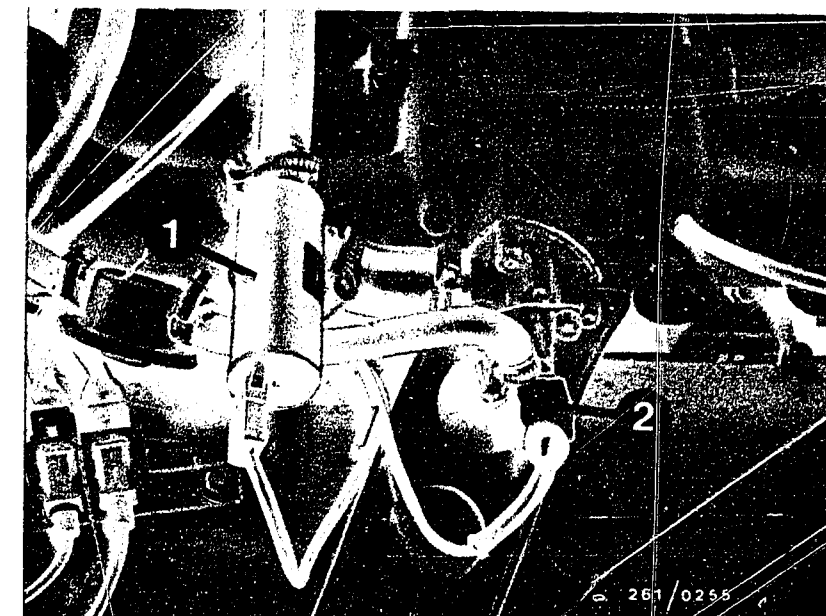
Check the ground connections for the thermotime switch

yes

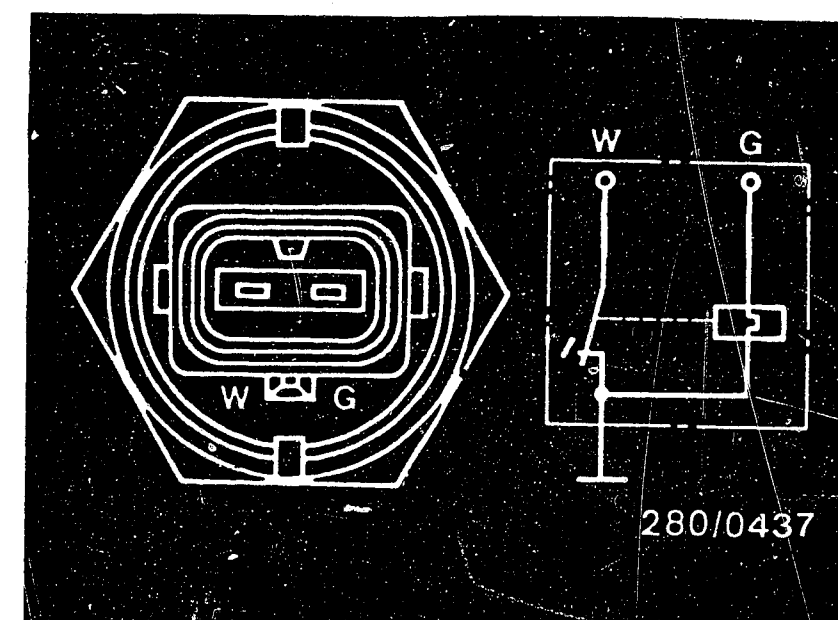
Continued on H11/H12

yes

Continued on H7/H8



1 = Idle actuator
2 = Start valve



H5

Engine does not start
BMW 325e (USA)



H6

Engine does not start
BMW 325e (USA)



Starting motor turns, engine does not start or starts only with difficulty (continued)

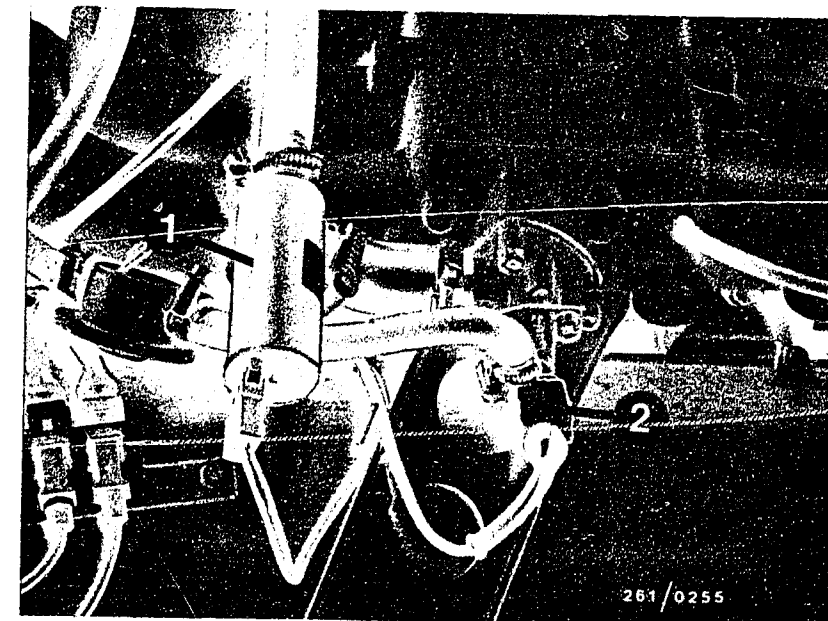
Check the start valve electrically:
Connect an ohmmeter to the start valve.
(Disconnect the connecting plug.)
Specified value approx. 4Ω

Check the start valve mechanically:
Remove the start valve from the intake pipe and hold it into a container. (Caution: fire hazard!)
During start, and at temperatures less than $+30^{\circ}\text{C}$, the start valve must spray fuel (max. 8 s).
With the engine at normal operating temperature (approx. $+80^{\circ}\text{C}$), the start valve must not spray fuel. With the ignition switched on, and the pressure built up, it is likewise not permissible for the start valve to spray fuel.

yes

Continued on H11/H12

Continued on H9/H10



1 = Idle actuator
2 = Start valve

H7

Engine does not start
BMW 325e (USA)



H8

Engine does not start
BMW 325e (USA)



Starting motor turns, engine does not start or starts only with difficulty (continued)

Run the fuel spray test with the engine at normal operating temperature (approx. +80° C) as follows: disconnect the plug from the thermotime switch and ground Term. W.

Check the start valve for leaks:

1. In the engine

Clamp off the fuel delivery line at the start valve. If the engine then runs, take out and replace the start valve.

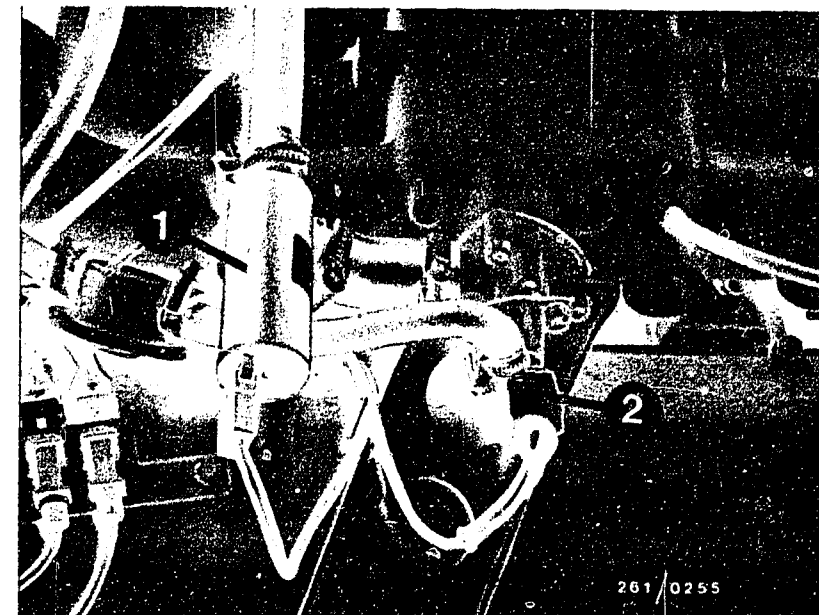
2. Taken out of the engine

Take out the start valve.
(Caution: fire hazard!) The fuel and the electrical lines remain connected. (Place a catch basin under the start valve.) Build up the fuel pressure: on the universal test adaptor, set the program switch "V" at setting 17. Switch ignition on, and press button T3.

Test specification: the formation of max. 1 drop is permissible at the opening of the valve within one minute.

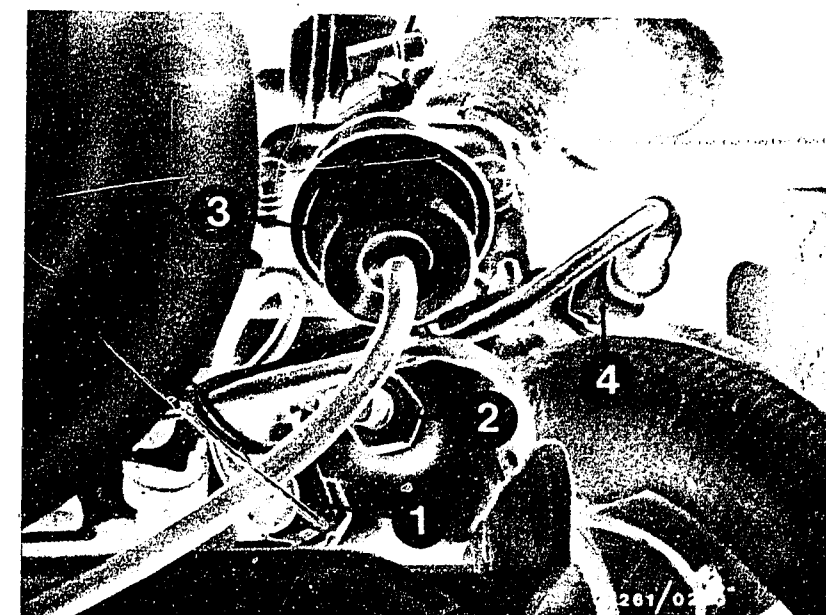
yes

Continued on H11/H12



1 = Idle actuator
2 = Start valve

1 = Temperature sensor, engine (NTC II)
2 = Sensor for remote thermometer
3 = Pressure regulator
4 = Thermotime switch



H9

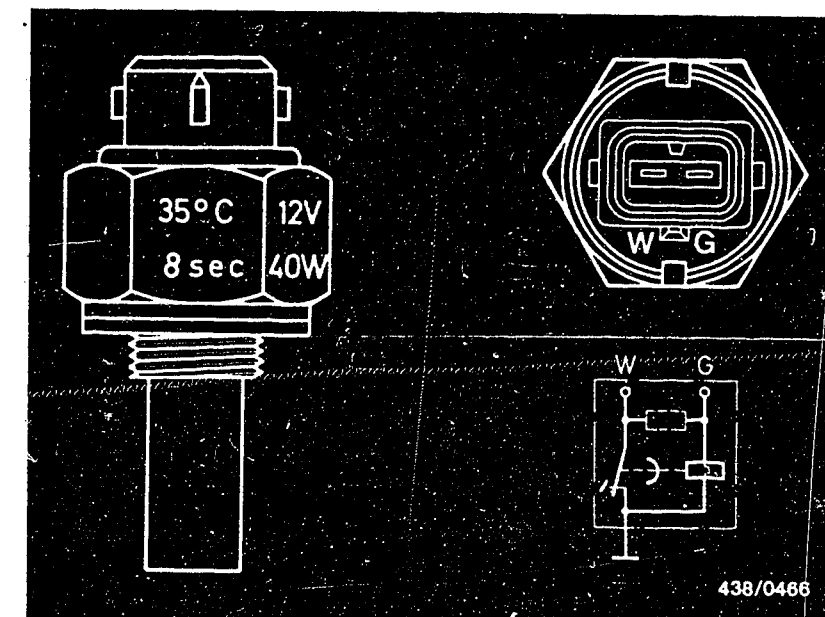
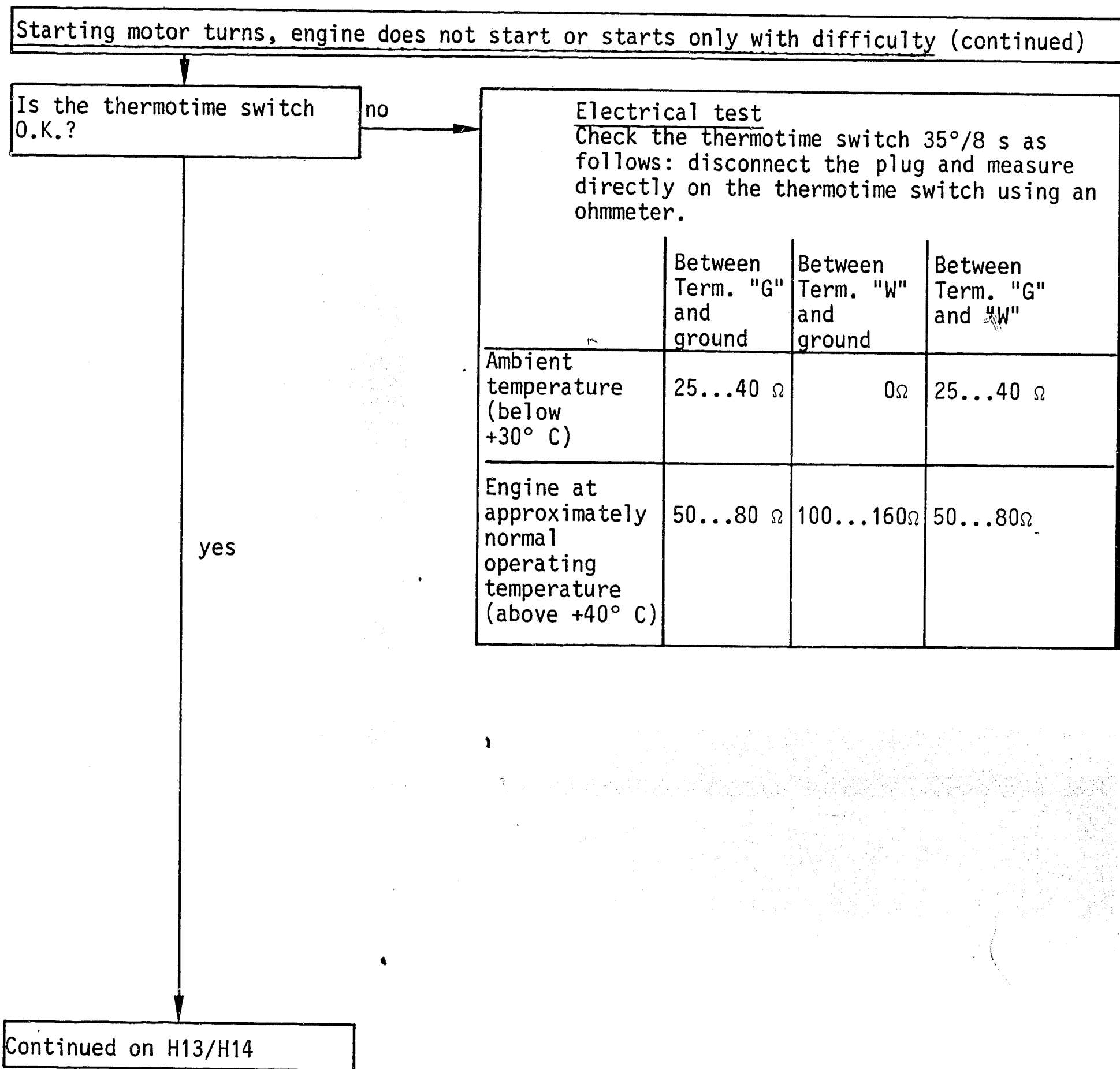
Engine does not start
BMW 325e (USA)



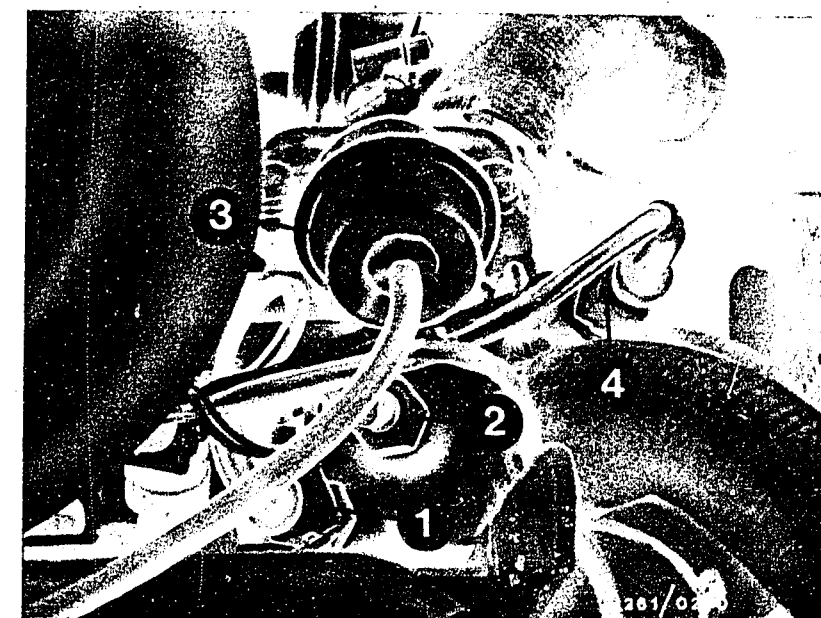
H10

Engine does not start
BMW 325e (USA)





4 = Thermotime switch



H11 Engine does not start
BMW 325e (USA)



H12 Engine does not start
BMW 325e (USA)



Starting motor turns, engine does not start or starts only with difficulty (continued)

yes

Is the air-flow sensor
O.K. mechanically?

no

Testing: Open the air-flow sensor flap by hand. It must be possible to open the sensor flap with uniform ease as far as the stop, and the flap must close again on its own as far as the stop. The air-flow sensor flap must not stick when opening. Watch for friction markings. If the air-flow sensor is severely fouled inside, clean it, and rub it out with a lint-free cloth. If there are friction markings present, the air-flow sensor must be taken out and replaced.

yes

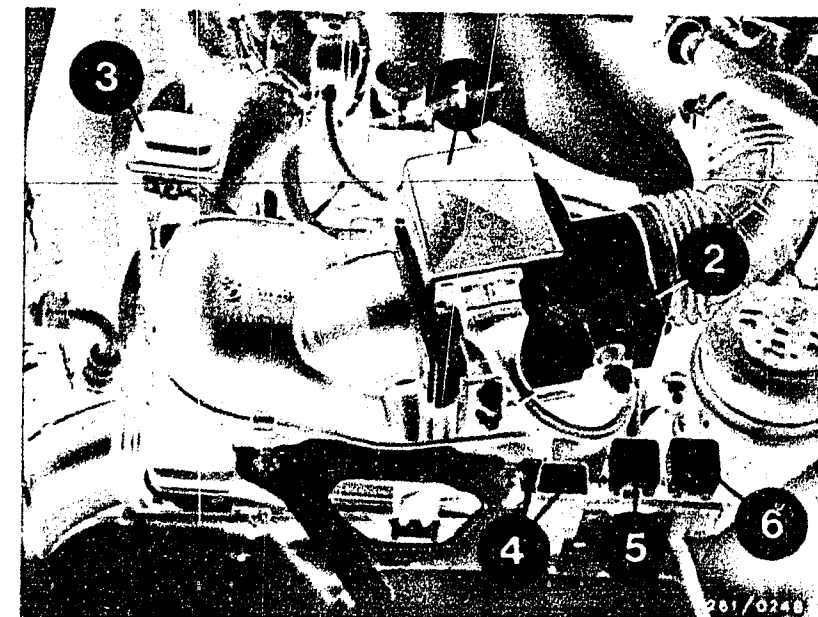
Are all the hose lines
and electrical lead
connections put on
correctly? Visual
inspection. Has the
intake system been
checked for leaks?

no

Check that the hoses on the air intake system and the fuel line system are put on correctly, without kinking or damage. If need be, take out and replace the hoses. Eliminate leaks by using new gaskets or by tightening the connecting screws. Testing for leaks: Seal off the exhaust pipe and the air inlet point on the air filter. Disconnect the hose between the air-flow sensor and the idle actuator at the air-flow sensor. Seal off the hose opening to the idle actuator and using a compressed air gun (0.3 gauge pressure), blow into the intake manifold. In so doing, open the throttle valve fully. Brush or spray soapy water on all joints after the air-flow sensor flap. Bubbling or foaming indicates leaks. Check electrical plug contacts for loose contacts.

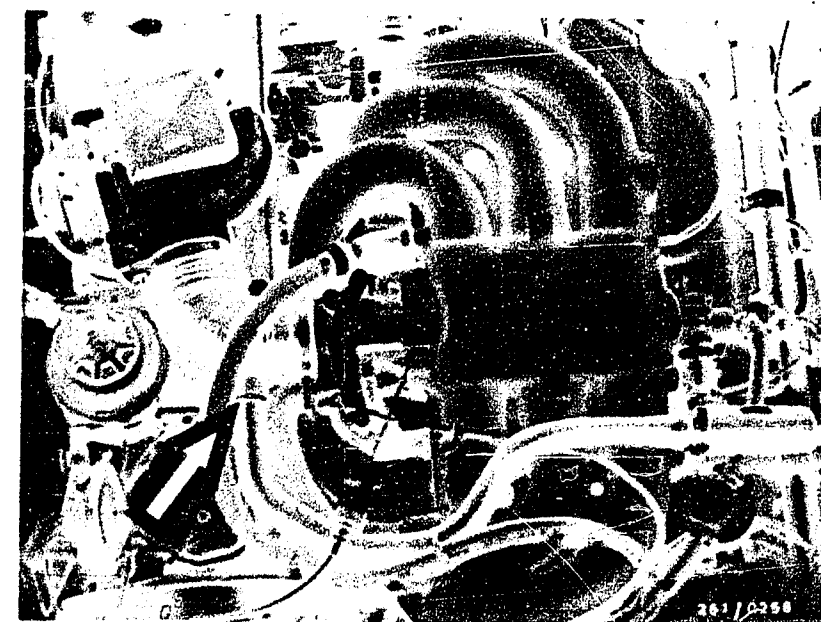
yes

Continued on H15/H16



1 = Air-flow sensor with NTC I
2 = Idle-mixture-adjusting screw

Arrow = Disconnect hose here for
leak test.



H13

Engine does not start
BMW 325e (USA)



H14

Engine does not start
BMW 325e (USA)



Starting motor turns, engine does not start or starts only with difficulty (continued)

yes

Checking the customer complaint
"Starting motor turns, engine does not or starts only with difficulty,"

has been completed.
Has the customer complaint been corrected?

no

Additional possible defects

- The customer complaint has been incorrectly identified. (See Coordinates C3 ... C10). If the defect has not been identified using the "Targeted Trouble-Shooting", see "Detailed Trouble-Shooting" (Coordinates C3/C4).
- Engine is not O.K. mechanically. (Compression, valve setting, valve timing, wear on camshaft).

H15

Engine does not start
BMW 325e (USA)



H16

Engine does not start
BMW 325e (USA)



ENGINE STARTS AND THEN DIES

Trouble-shooting program according to customer complaint

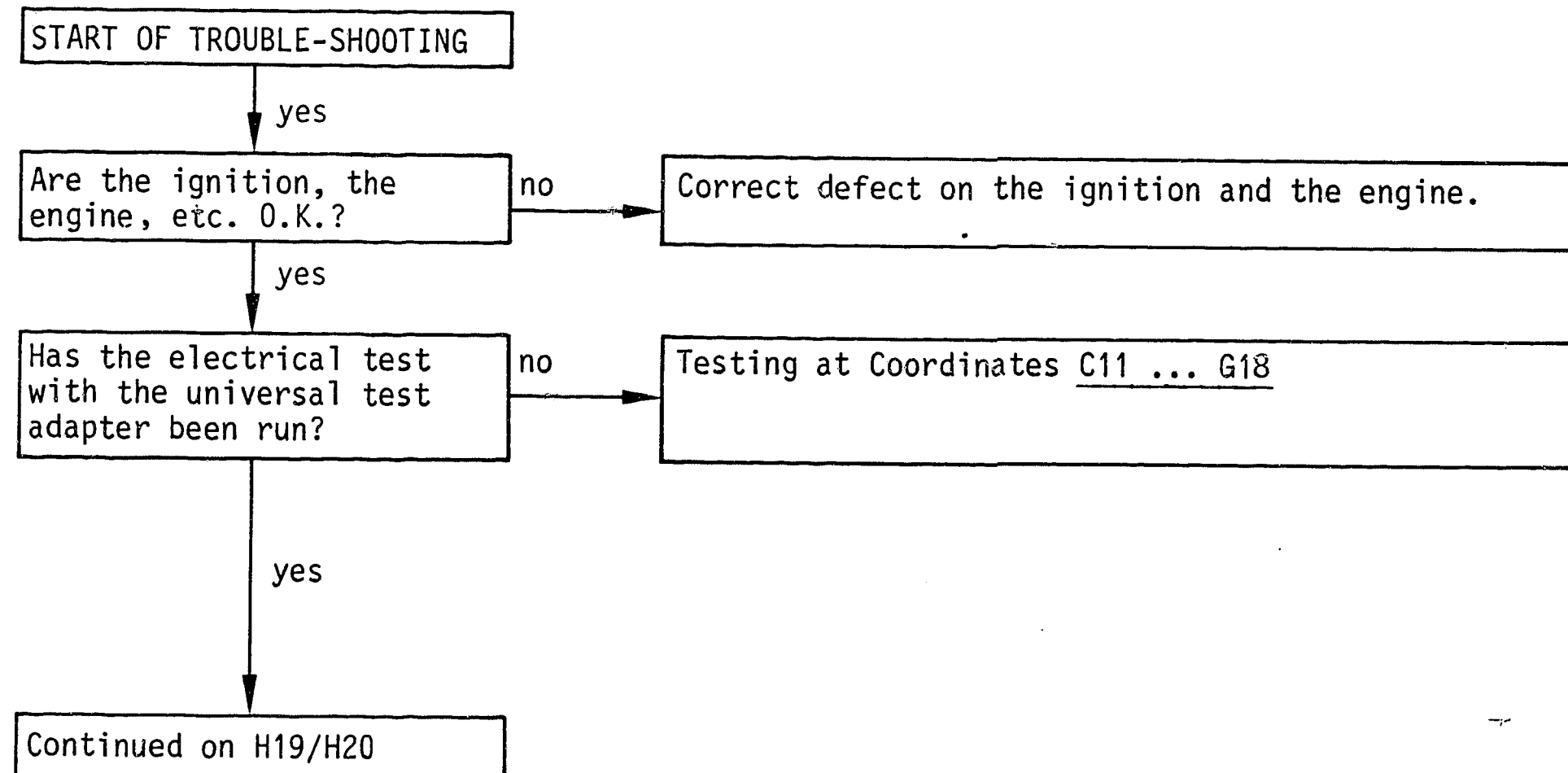
How to use the program

Testing is organized into 3 columns of boxes:

- In the column at the left are the questions for the tests being run.
- In the column in the center the component tests and settings are described.
- The column at the right shows the figures belonging to the text and the legend for the figures.

If it is possible to answer the questions clearly with "yes" even without testing, proceed to the next question below.

On the other hand, if the answer to the question is "no", and a defect is suspected, you must switch to the center column of boxes and carry through the tests indicated there. At the end of the test, the trouble-shooting is continued at that point at which the shift was made previously.

**H17**

Engine starts and then dies
BMW 325e (USA)

**H18**

Engine starts and then dies
BMW 325e (USA)



Engine starts and then dies (continued)

yes

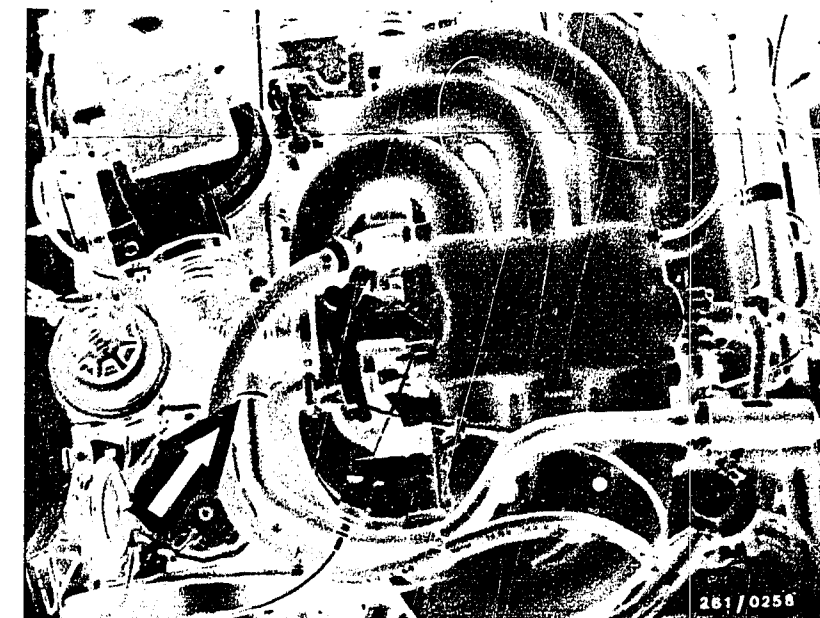
Are all the hose lines and electrical lead connections put on correctly? Visual inspection. Has the intake system been checked for leaks?

no

Check that the hoses on the air intake system and the fuel line system are put on correctly, without kinking or damage. If need be, take out and replace the hoses. Eliminate leaks by using new gaskets or by tightening the connecting screws. Testing for leaks: Seal off the exhaust pipe and the air inlet point on the air filter. Disconnect the hose between the air-flow sensor and the idle actuator at the air-flow sensor. Seal off the hose opening to the idle actuator and using a compressed air gun (0.3 bar gauge pressure), blow into the intake manifold. In doing so, open the throttle valve fully. Brush or spray soapy water on all joints after the air-flow sensor flap. Bubbling or foaming indicates leaks. Check electrical plug contacts for loose contacts.

yes

Continued on H21/H22



Arrow = Disconnect hose here for leak test.

H19

Engine starts then dies
BMW 325e (USA)



H20

Engine starts then dies
BMW 325e (USA)



Engine starts and then dies (continued)

yes

Is the idle speed control
(from VDO) O.K.?

no

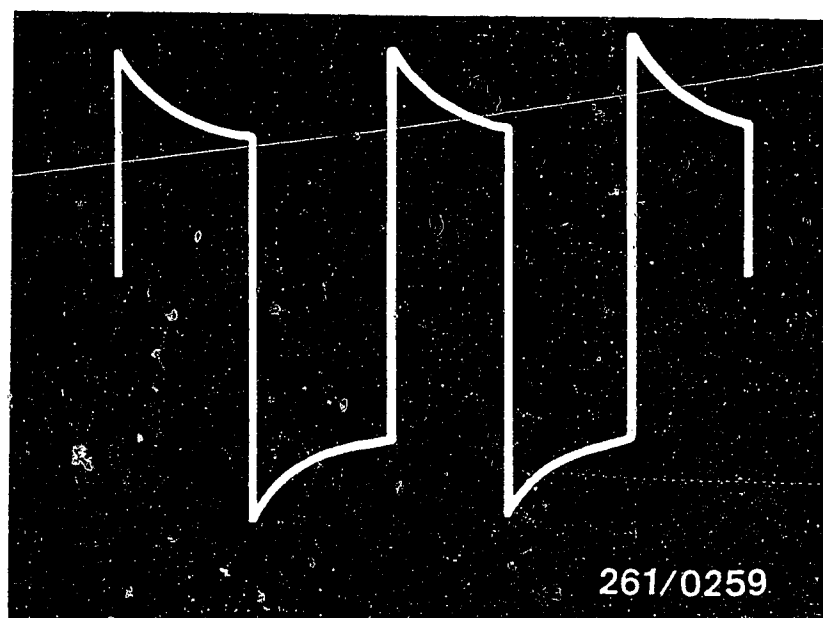
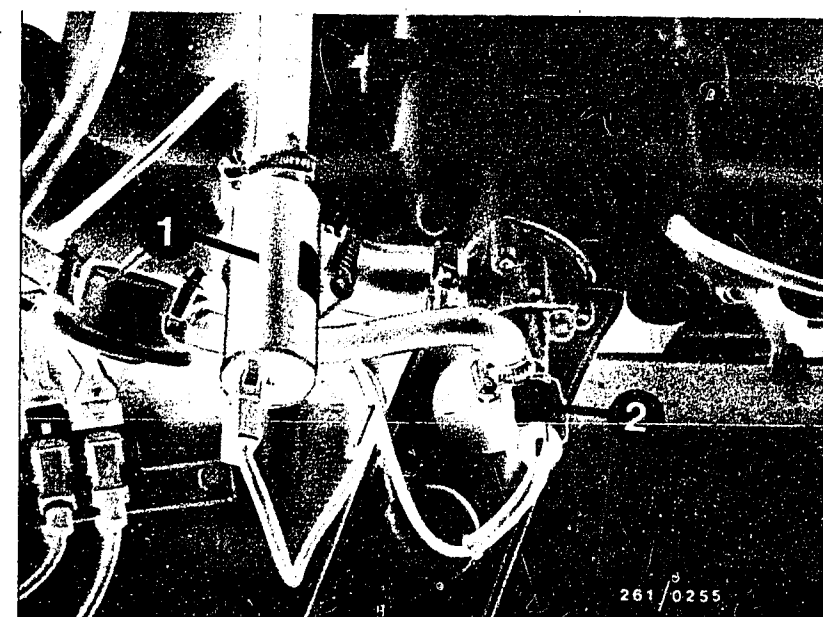
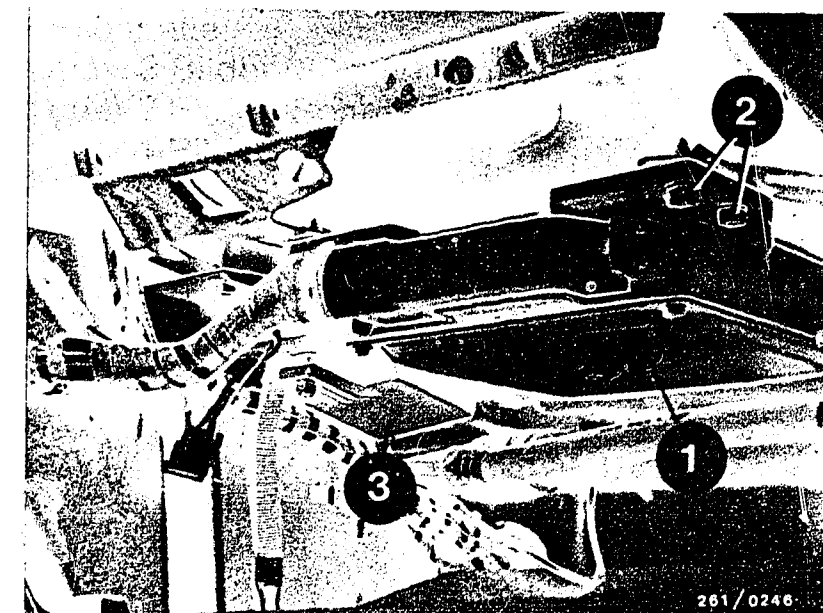
If the engine hunts, take out and replace the idle speed control control unit (Figure at the top - Item 3). Measure the coil resistance of the idle actuator (Figure at center - Item 1): if there is a break or if the reading is $0\ \Omega$, the actuator is defective.

Measure the pulses on the actuator plug. Pulses must be visible on the oscilloscope at idle speed (Figure at the bottom). If there are no pulses: examine the power supply for the idle speed control control unit and/or take out and replace the idle speed control control unit.

Additional cause of defects:
The actuator is mechanically defective.

yes

Continued on H23/H24



H21

Engine starts and then dies
BMW 325e (USA)



H22

Engine starts and then dies
BMW 325e (USA)



Engine starts and then dies (continued)

yes

Is the start valve O.K.?

no

Check the start valve for leaks:

1. In the engine

Clamp off the fuel delivery line at the start valve. If the engine then runs smooth, take out and replace the start valve.

2. Taken out of the engine

Take out the start valve.

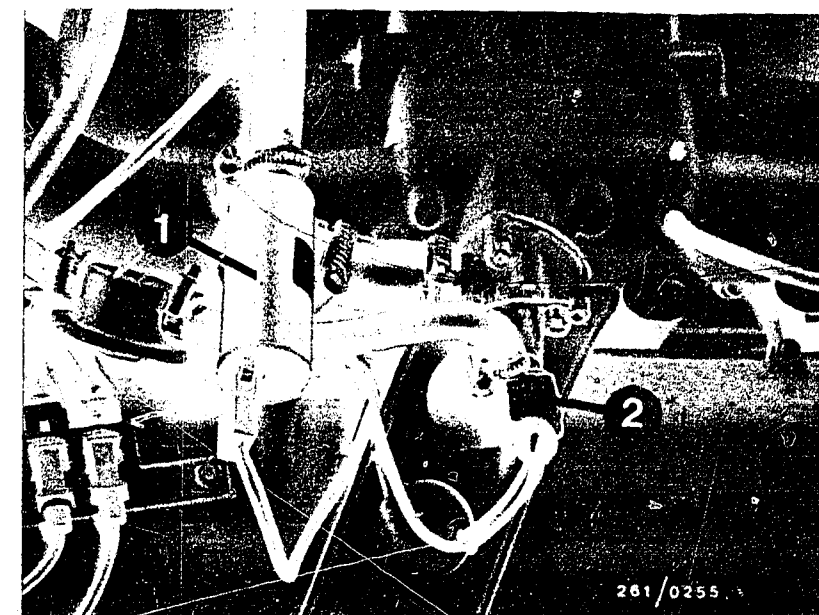
(Caution: fire hazard!) The fuel and the electrical lines remain connected. (Place a catch basin under the start valve.)

Build up the fuel pressure: on the universal test adapter, set the program switch "V" at setting 17. Switch ignition on, and press button T3.

Test specification: the formation of max. 1 drop is permissible at the opening of the valve within one minute.

yes

Continued on J1/J2



1 = Idle actuator

2 = Start valve

H23

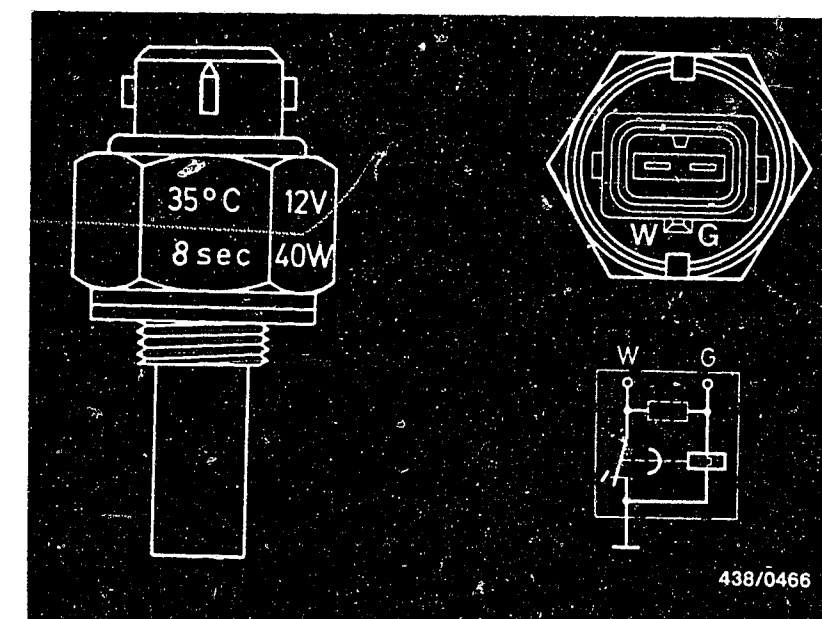
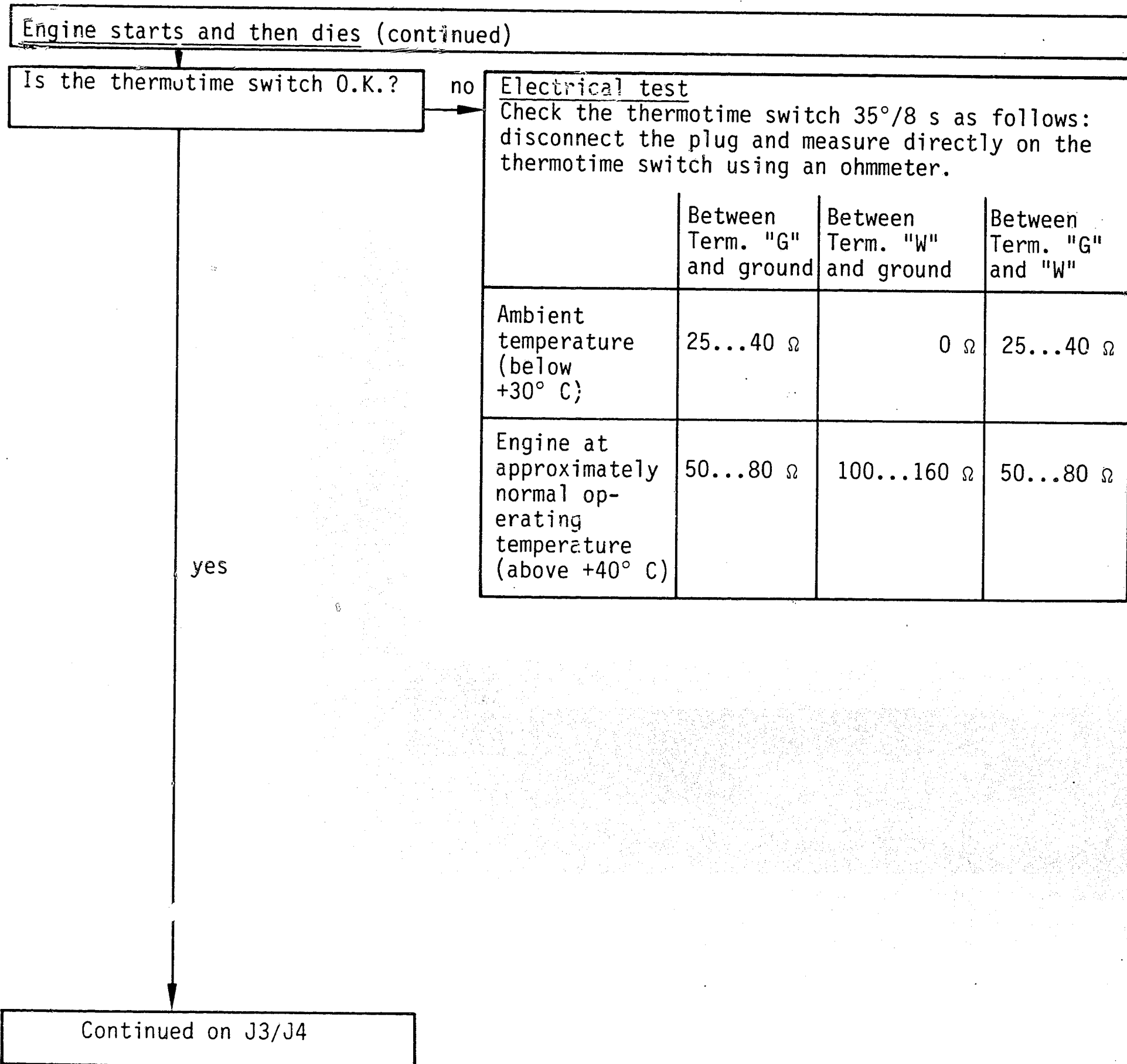
Engine starts and then dies
BMW 325e (USA)



H24

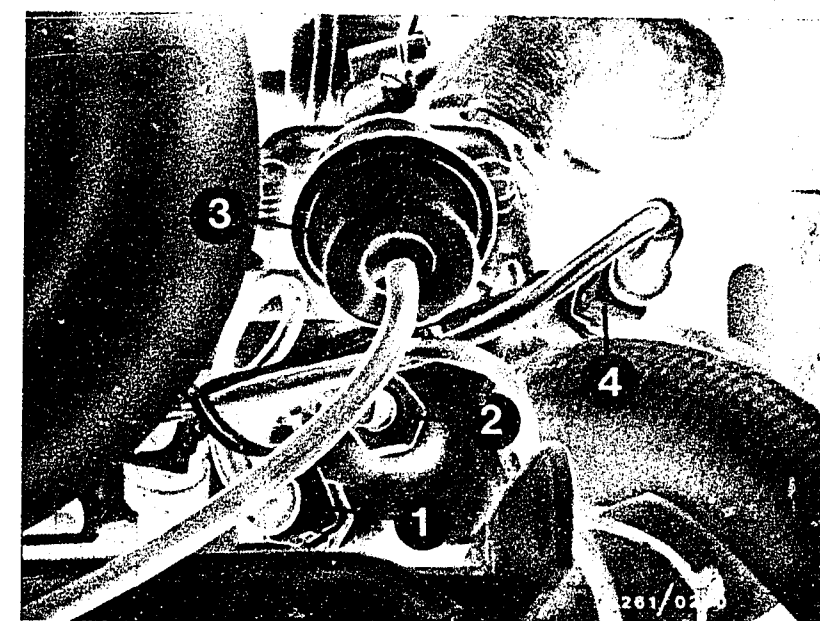
Engine starts and then dies
BMW 325e (USA)





Thermotime switch
35° C / 8 s.

4 = Thermotime switch



J1

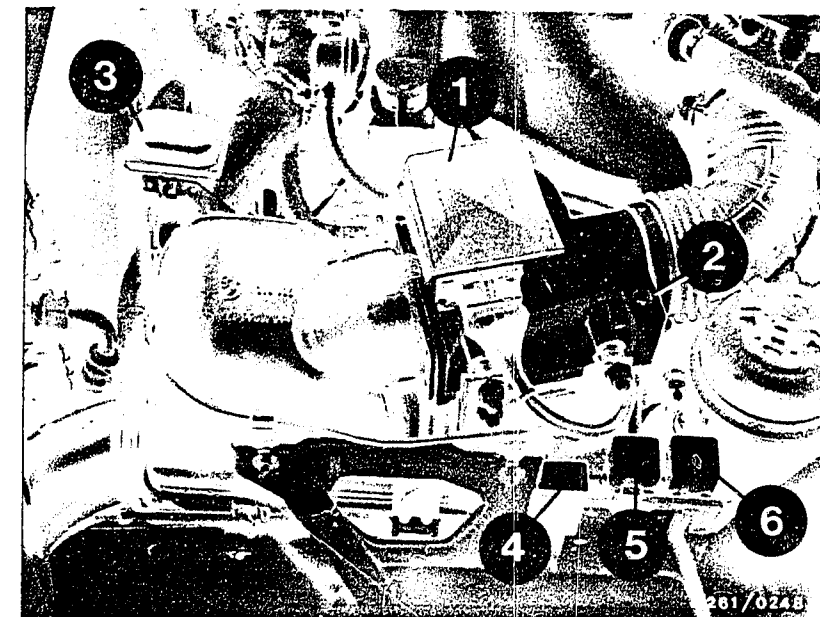
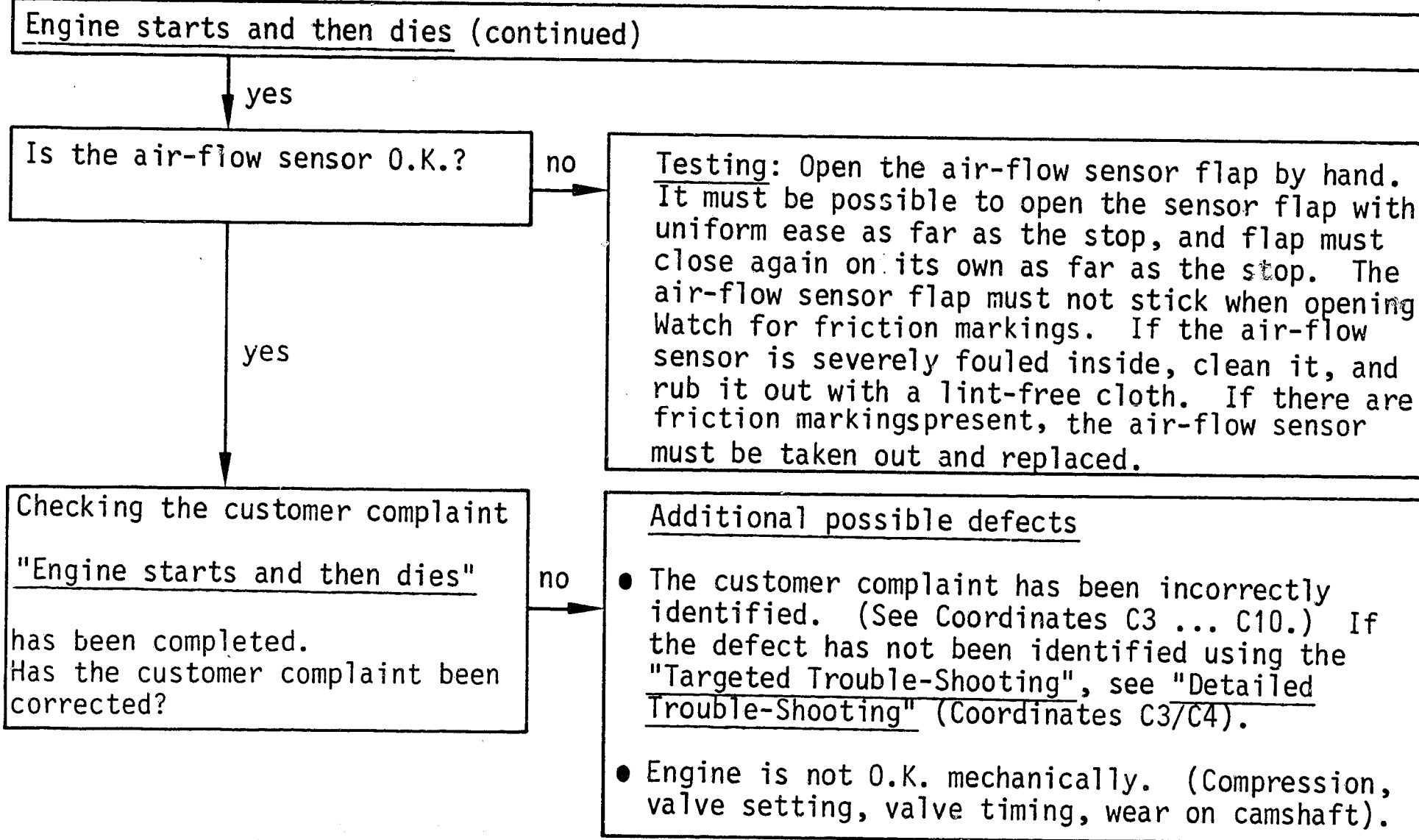
Engine starts and then dies
BMW 325e (USA)



J2

Engine starts and then dies
BMW 325e (USA)





1 = Air-flow sensor with NTC I
2 = Idle-mixture-adjusting screw

J3

Engine starts and then dies
BMW 325e (USA)



J4

Engine starts and then dies
BMW 325e (USA)



ROUGH IDLE, AND/OR INCORRECT IDLE SPEED

Trouble-shooting program according to customer complaint

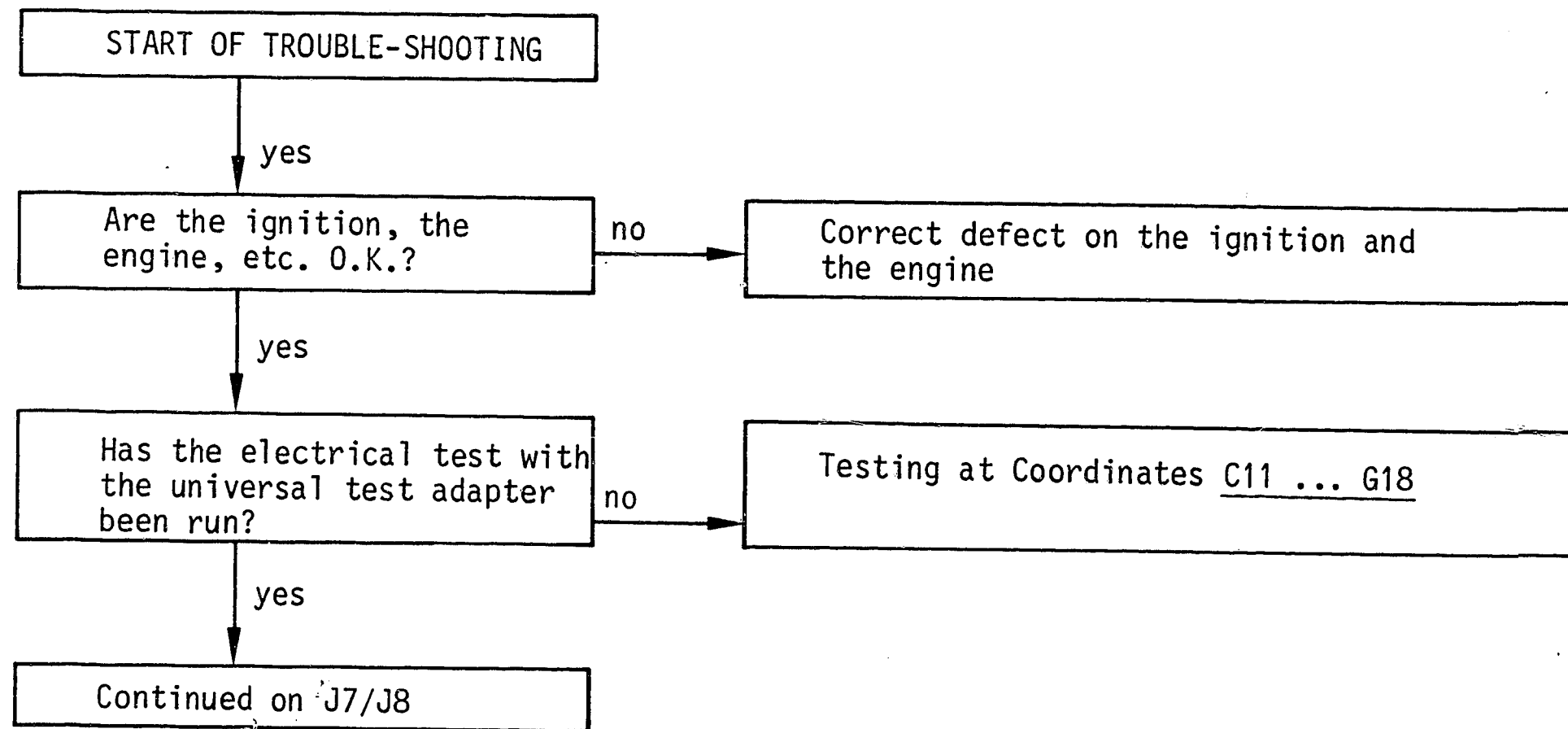
How to use the program

Testing is organized into 3 columns of boxes:

- In the column at the left are the questions for the tests being run.
- In the column in the center the component tests and settings are described.
- The column at the right shows the figures belonging to the text and the legend for the figures.

If it is possible to answer the questions clearly with "yes" even without testing, proceed to the next question below.

On the other hand, if the answer to the question is "no", and a defect is suspected, you must switch to the center column of boxes and carry through the tests indicated there. At the end of the test, the trouble-shooting is continued at that point at which the shift was made previously.



J5

Rough idle
BMW 325e (USA)



J6

Rough idle
BMW 325e (USA)



Rough idle and/or incorrect idle speed (continued)

yes

Check the secondary pattern for all cylinders.
Is the secondary pattern O.K.?

no

Check the ignition coil and the high voltage portion: is the distributor cap covered with oil on the outside and inside? (Unscrew the distributor rotor and check the camshaft seal.)

Notes:

Distributor cap is fastened with 3 screws. To remove the distributor cap the cover of the radiator must be removed. When putting the ignition leads on, watch the cylinder number! Do not forget the cover and shielding cap! Check the primary ignition coil for continuity (approx. 0Ω).

Secondary coil resistance: 5 to 7.2 k Ω . Check the interference suppression resistors, the ignition leads, and the spark plugs.

Interference-suppression resistance in

Ignition distributor rotor:	1 k Ω
Ignition distributor housings: each	1 k Ω
Spark-plug connectors: each	5 k Ω
Spark plugs:	5 k Ω
Ignition coil:	1 k Ω

yes

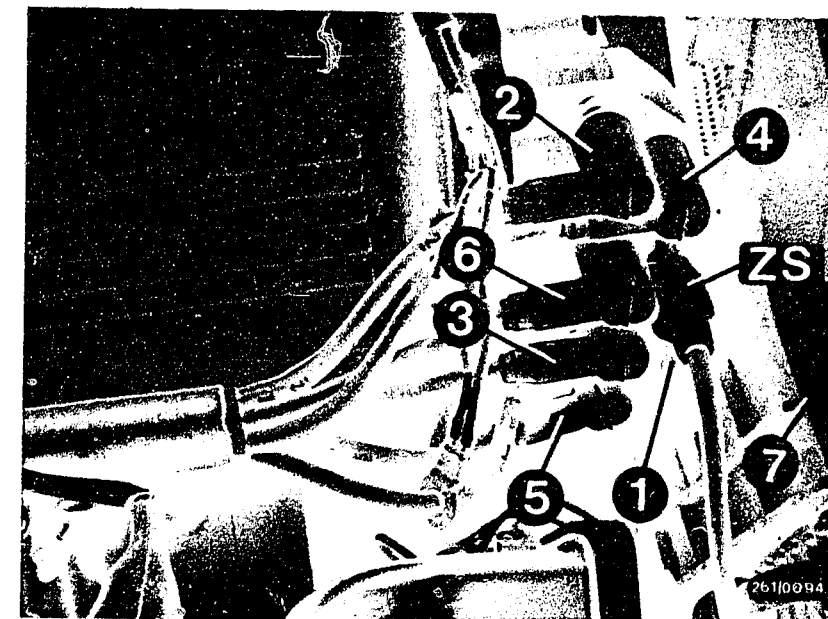
Is the air-flow sensor O.K.?

no

Testing: Open the air-flow sensor flap by hand. It must be possible to open the sensor flap with uniform ease as far as the stop, and the flap must close again on its own as far as the stop. The air-flow sensor flap must not stick when opening. Watch for friction markings. If the air-flow sensor is severely fouled inside, clean it, and rub it out with a lint-free cloth. If there are friction markings present, the air-flow sensor must be taken out and replaced.

yes

Continued on J9/J10



High voltage distributor

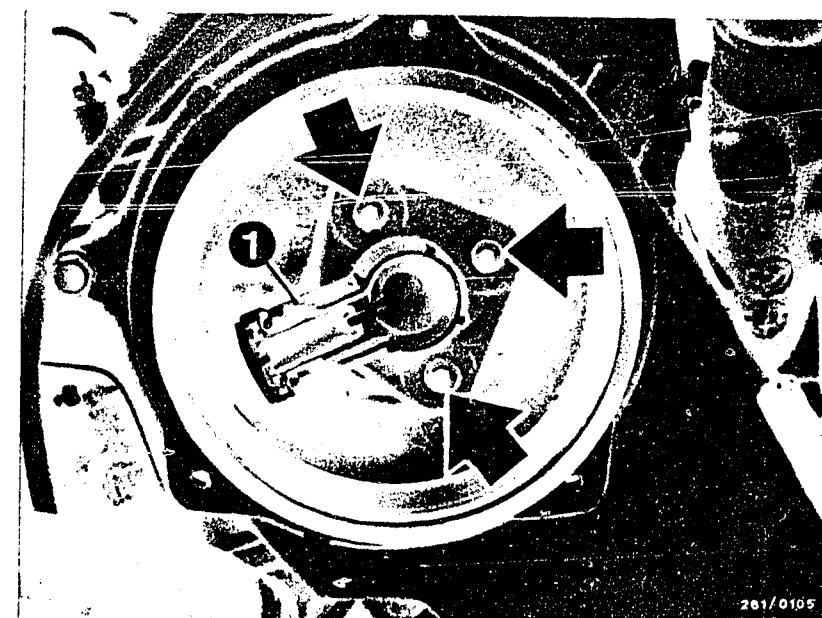
1 - 6 = Cylinder numbers

ZS = High voltage lead to the ignition coil

7 = Radiator cover

1 = Distributor rotor

Arrow = Fastening screws



J7

Rough idle

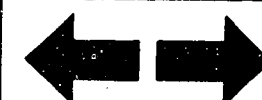
BMW 325e (USA)



J8

Rough idle

BMW 325e (USA)



Rough idle and/or incorrect idle speed (continued)

yes

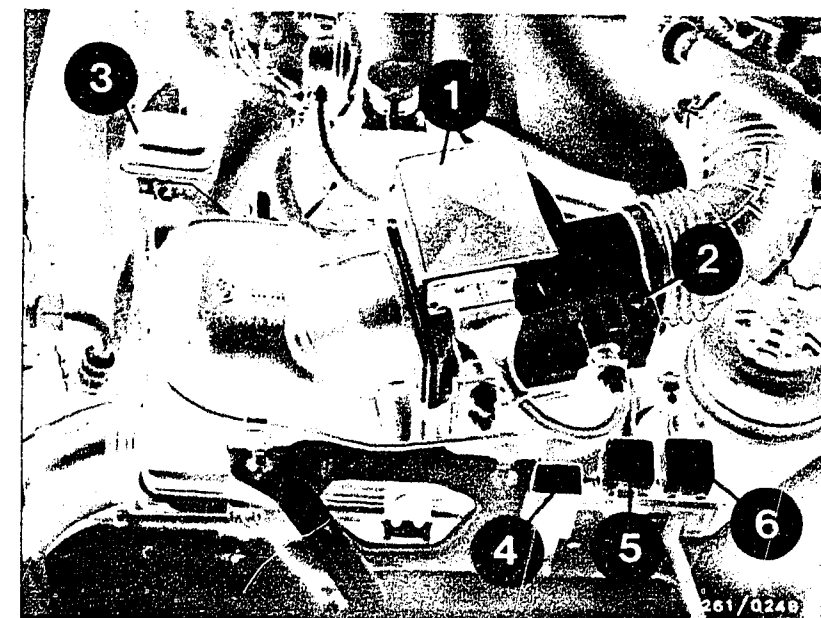
Are all the hose lines and electrical lead connections put on correctly? Visual inspection. Has the intake system been checked for leaks?

no

Check that the hoses on the air intake system and the fuel line system are put on correctly, without kinking or damage. If need be, take out and replace the hoses. Eliminate leaks by using new gaskets or by tightening the connecting screws. Testing for leaks: Seal off the exhaust pipe and the air inlet point on the air filter. Disconnect the hose between the air-flow sensor and the idle actuator at the air-flow sensor. Seal off the hose opening to the idle actuator and using a compressed air gun (0.3 bar gauge pressure), blow into the intake manifold. In so doing, open the throttle valve fully. Brush or spray soapy water on all joints after the air-flow sensor flap. Bubbling or foaming indicates leaks. Check electrical plug contacts for loose contacts.

yes

Continued on J11/J12



1 = Air-flow sensor with NTC I
2 = Idle-mixture-adjusting screw

J9

Rough idle
BMW 325e (USA)



J10

Rough idle
BMW 325e (USA)



Rough idle and/or incorrect idle speed (continued)

yes

Is the idle speed control (from VDO) O.K.?

no

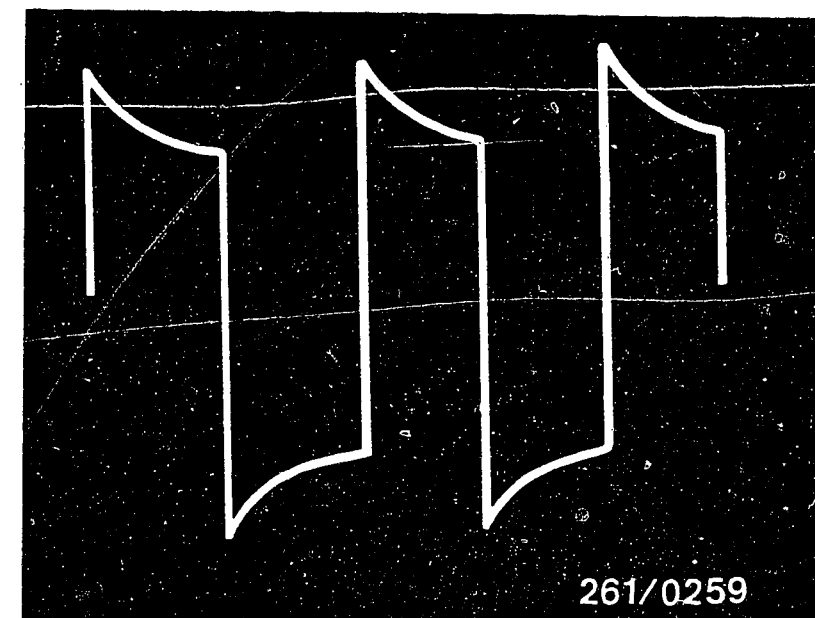
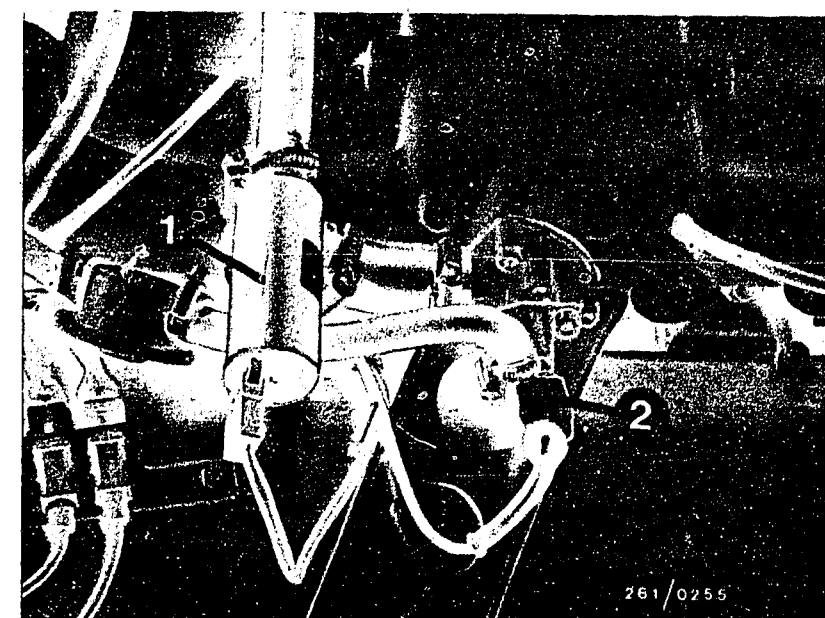
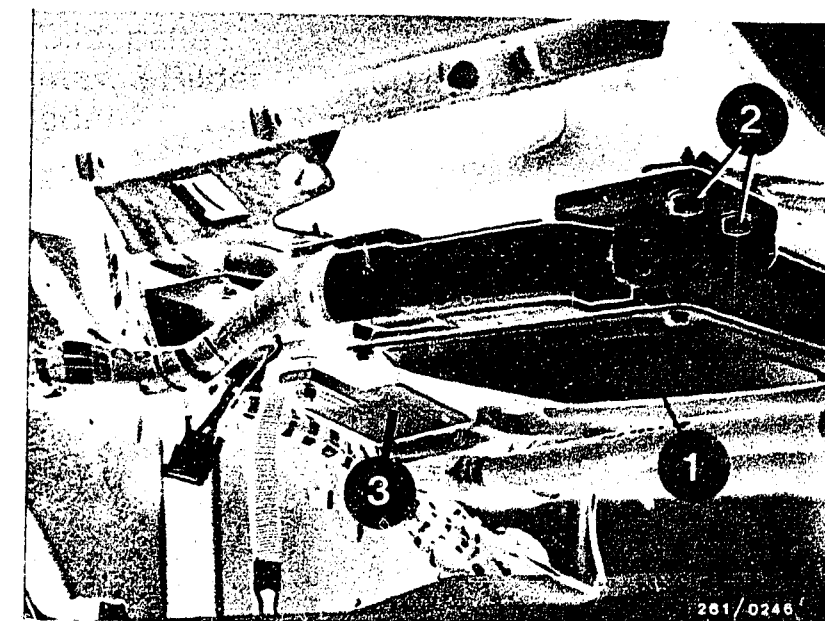
If the engine hunts, take out and replace the idle speed control control unit (Figure at the top - Item 3). Measure the coil resistance of the idle actuator (Figure at the center - Item 1): if there is a break or if the reading is $0\ \Omega$, the actuator is defective.

Measure the pulses on the actuator plug. Pulses must be visible on the oscilloscope at idle speed (Figure at the bottom). If there are no pulses: examine the power supply for the idle speed control control unit and/or take out and replace the idle speed control control unit.

Additional cause of defects:
The actuator is mechanically defective.

yes

Continued on J13/J14



J11

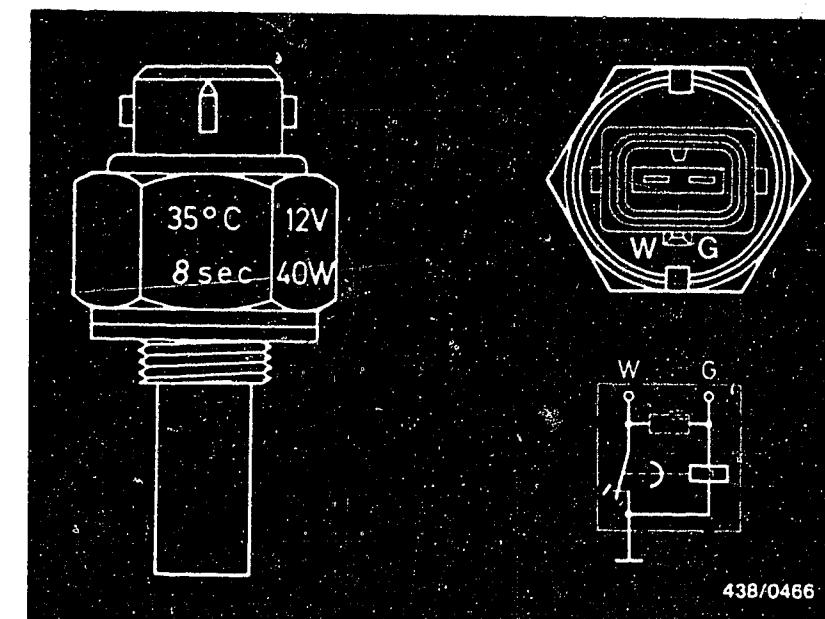
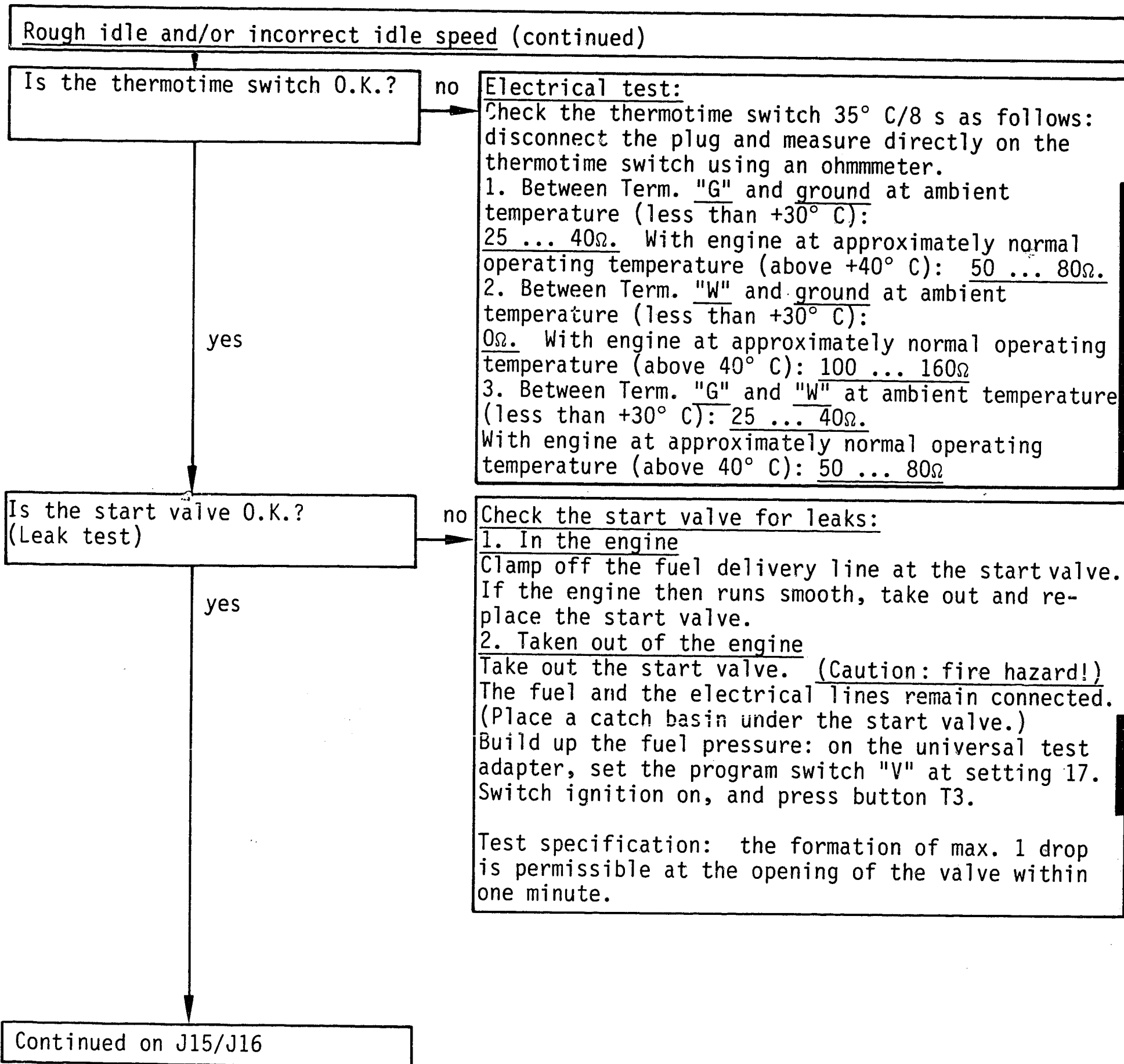
Rough idle
BMW 325e (USA)



J12

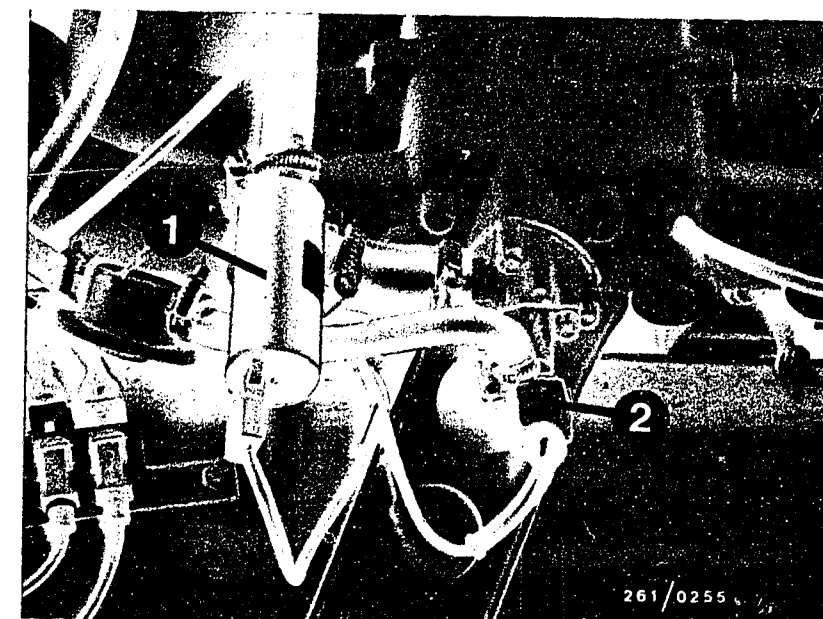
Rough idle
BMW 325e (USA)





Thermotime switch
35° C / 8 s.

2 = Start valve



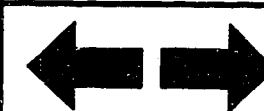
J13

Rough idle
BMW 325e (USA)



J14

Rough idle
BMW 325e (USA)



Rough idle and/or incorrect idle speed (continued)

yes

Solenoid-operated fuel-injection valves:

1. Mechanically O.K.?
2. O-ring O.K. (unmetered air)?

no

1. With the engine running, disconnect the solenoid-operated fuel-injection valve connectors individually, one after the other, from the injection valve, and plug them back on. If the solenoid-operated fuel-injection valve is good, the engine speed must drop off. If not, take out and replace the solenoid-operated fuel-injection valve.

2. Defective O-rings on the protection sleeve lead to unmetered air and thus to leaning of the mixture. Defective O-rings at the fuel distributor pipe cause leaks and thereby leakage. Take out and replace defective O-rings.

3. If the solenoid-operated fuel-injection valves are clogged with dirt deposits, take out and replace the solenoid-operated fuel-injection valves.

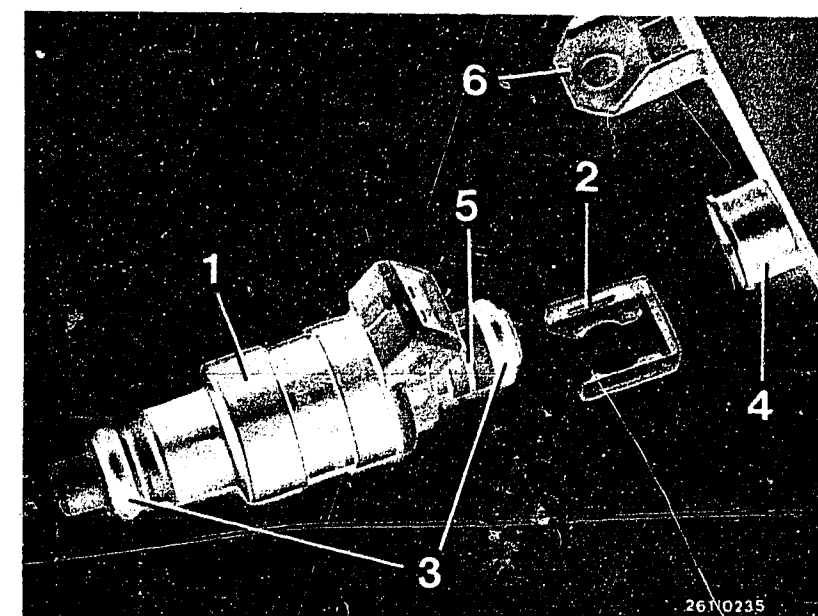
Taking out the solenoid operated fuel-injection valves

Release the fastening screws on the fuel distribution pipe. Pull the fuel distribution pipe up until the solenoid-operated fuel-injection valves are out of the hole in the intake manifold. Do not damage the nozzle needle or the rubber gasket. Check the nozzle needles and the area around them for tightness of seal and for dirt deposits. Disconnect the electrical connection. Carefully shove the holding bracket out of the slot and pull the solenoid-operated fuel-injection valve out of the fuel distribution pipe connection.

yes

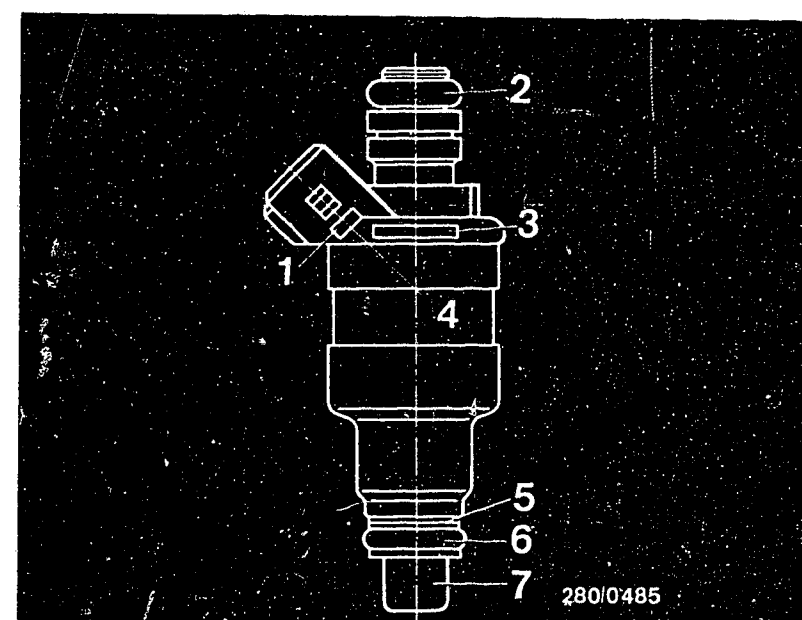
Continued on J19/J20

Continued on J17/J18



- 1 = Solenoid-operated fuel-injection valve
- 2 = Holding bracket
- 3 = Rubber gasket
- 4 = Fuel distribution pipe connection
- 5 = Slot
- 6 = Fastening tab

- 2 = Top O-ring
- 6 = Bottom O-ring
- 7 = Protection sleeve



J15

Rough idle

BMW 325e (USA)



J16

Rough idle

BMW 325e (USA)



Rough idle and/or incorrect idle speed (continued)

yes

Caution!

Catch any fuel that runs out. Do not allow it to drip on hot portions of the engine. Fire hazard!

Caution!

The protection sleeve must not be pried off.
Installation of the solenoid-operated fuel-injection valves

Take out and replace damaged or swollen O-rings.
Use set of parts 1 287 010 704.

Cut the lower O-ring (intake tube) into pieces.

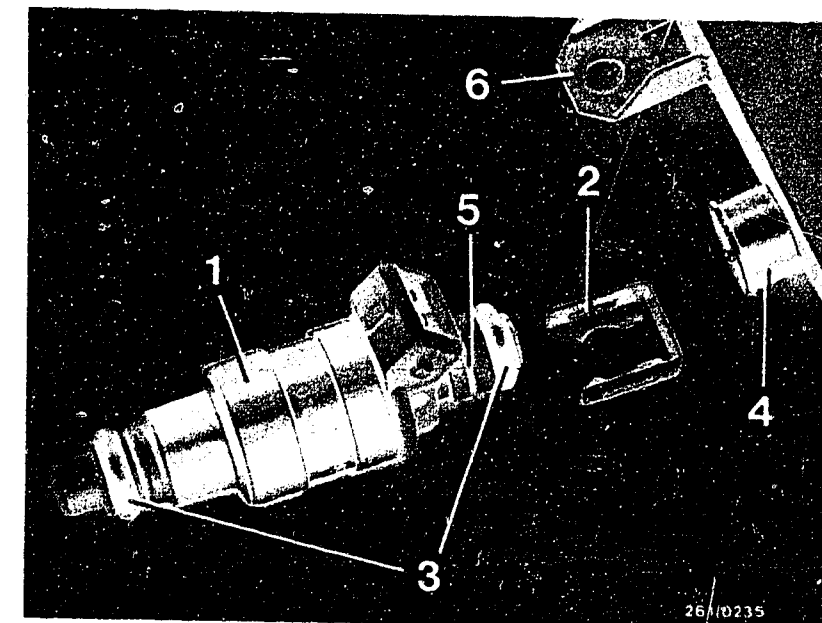
Caution! Do not damage the protection sleeve.

Pull a new O-ring over the protection sleeve and the shoulder on it. Do not damage any parts in so doing.

Before installation, check both rubber gaskets for proper seating. Fasten the solenoid-operated fuel-injection valves to the fuel distribution pipe. All solenoid-operated fuel-injection valves are to be pressed into the seats at the same time using the fuel distribution pipe. Screw the fuel distribution pipe tight. Check all air and fuel hoses for proper seating.

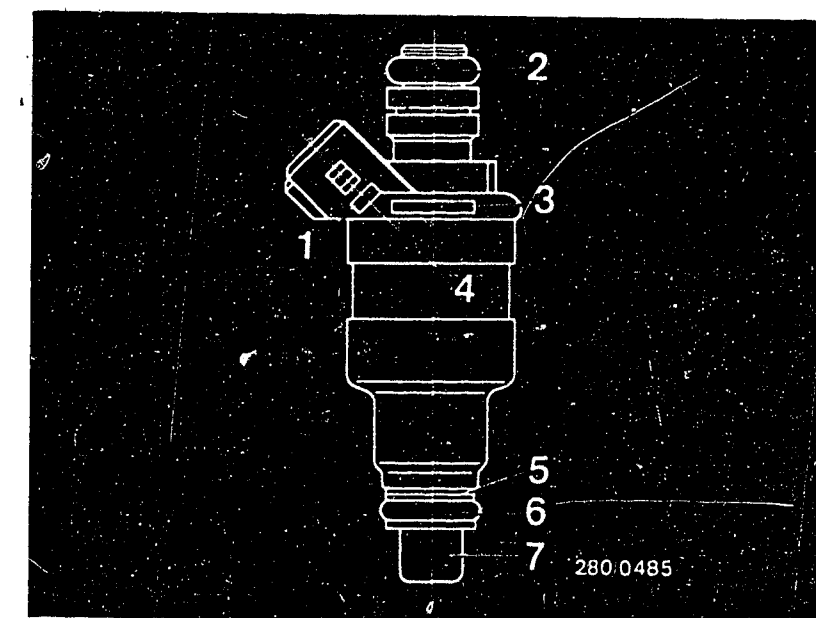
Make electrical connections.

Start the engine and check that no unmetered air is being drawn in.



- 1 = Solenoid-operated fuel-injection valve
- 2 = Holding bracket
- 3 = Rubber gasket
- 4 = Fuel distribution pipe connection
- 5 = Slot
- 6 = Fastening tab

- 2 = Top O-ring
- 6 = Bottom O-ring
- 7 = Protection sleeve



Continued on J19/J20

J17

Rough idle

BMW 325e (USA)



J18

Rough idle

BMW 325e (USA)



Rough idle and/or incorrect idle speed (continued)

yes

Idle speed with engine at normal operating temperature:
650 ... 750 min⁻¹

Measure the exhaust gas value with the engine at normal operating temperature in front of the catalytic converter:
0.5 ... 0.8 vol. %CO

Before testing, disconnect the hose to the activated carbon filter, switch off the loads, and take apart the lambda sensor plug connection.

no

- The idle speed cannot be adjusted. It is permanently set in the idle speed control control unit, and is determined by the idle actuator.
- Adjust the exhaust gas using the idle-mixture-adjusting screw in the air-flow sensor. To do so, remove the plug using a special tool.

If the CO cannot be adjusted:

- If the CO-level is too low: repeat the leak test on the intake system.
- If the CO-level is too high: take out and replace the air-flow sensor.

Note:

After adjusting the CO-level, insert a new plug into the air-flow sensor.

yes

Checking the customer complaint

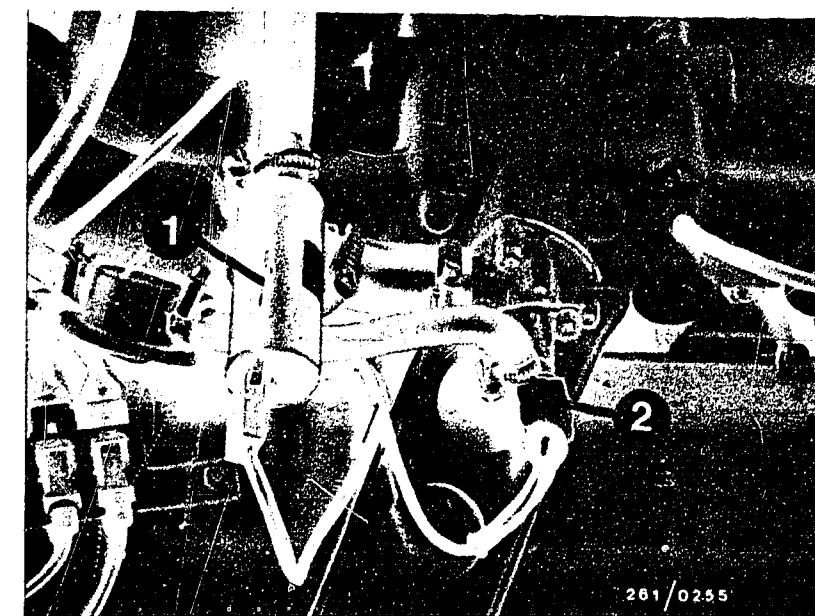
"Rough idle, engine speed adjustment (idle), and exhaust gas setting,"

has been completed.
Has the customer complaint been corrected?

no

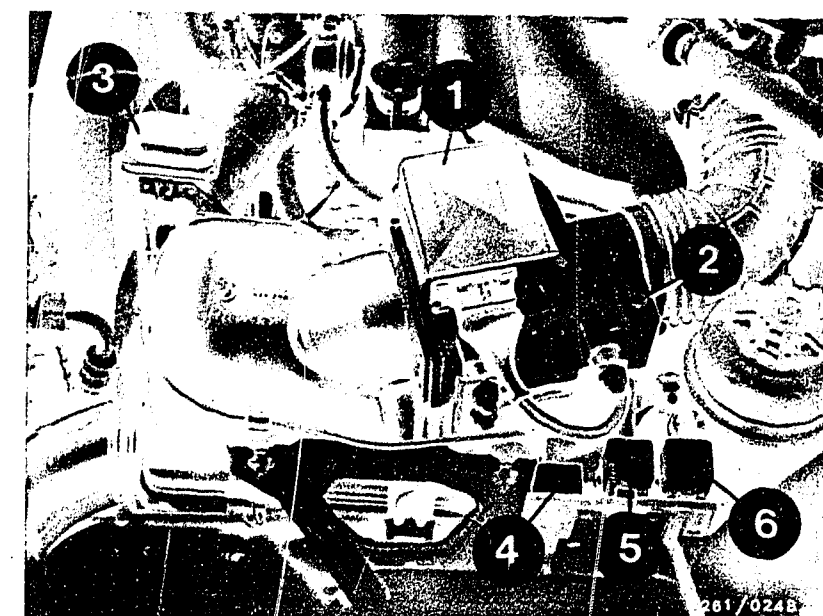
Additional possible defects

- The customer complaint has been incorrectly identified. (See Coordinates C3 ... C10.) If the defect has not been identified using the "Target Trouble-Shooting", see "Detailed Trouble-Shooting" (Coordinates C3/C4).
- Engine is not O.K. mechanically. (Compression, valve setting, valve timing, wear on camshaft).



1 = Idle actuator
2 = Start valve

1 = Air-flow sensor with NTC I
2 = Idle-mixture-adjusting screw



J19

Rough idle
BMW 325e (USA)



J20

Rough idle
BMW 325e (USA)



POOR THROTTLE TAKE-UP

Trouble-shooting program according to customer complaint

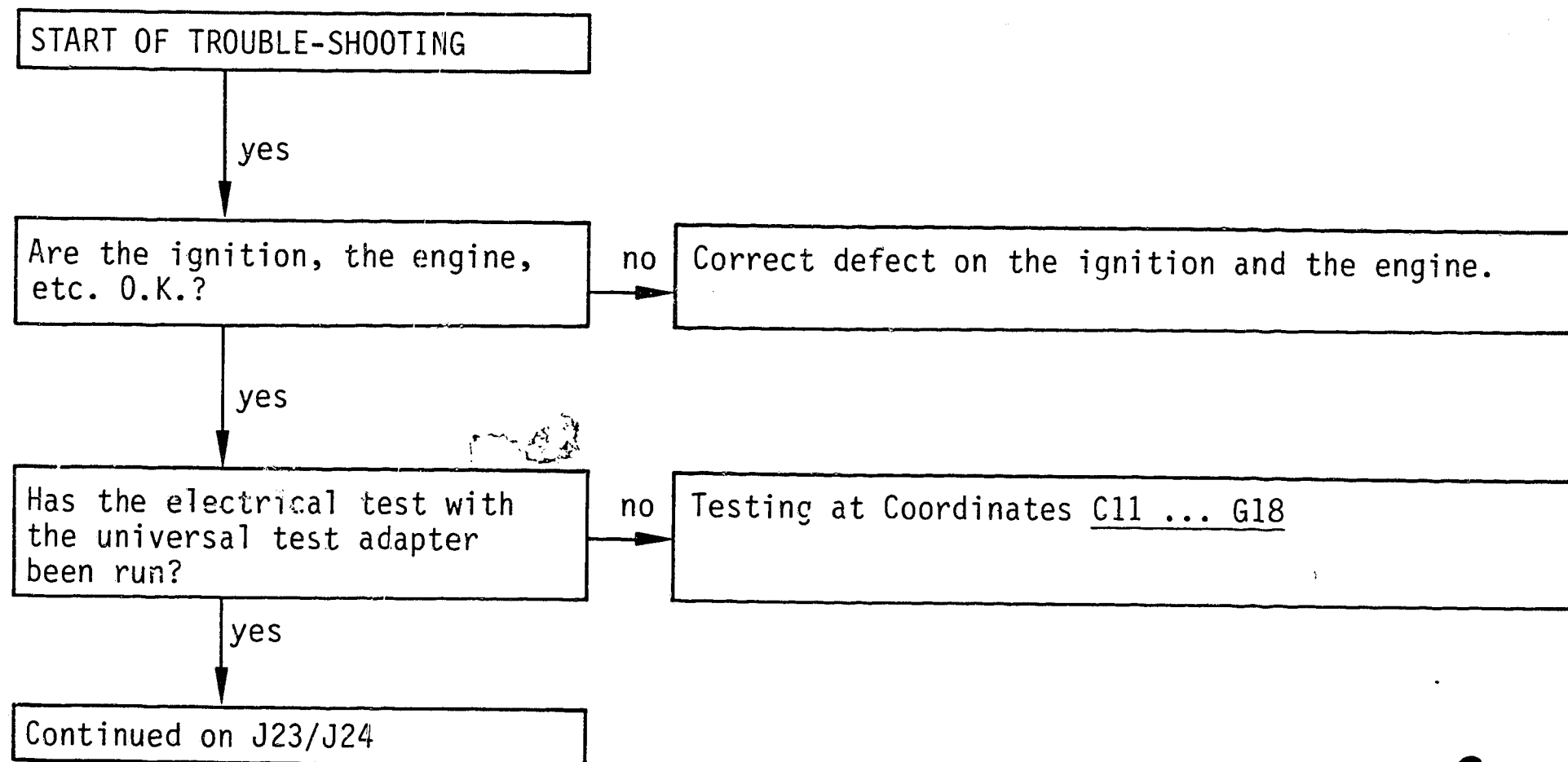
How to use the program

Testing is organized into 3 columns of boxes:

- In the column at the left are the questions for the tests being run.
- In the column in the center the component tests and settings are described.
- The column at the right shows the figures belonging to the text and the legend for the figures.

If it is possible to answer the questions clearly with "yes" even without testing, proceed to the next question below.

On the other hand, if the answer to the question is "no", and a defect is suspected, you must switch to the center column of boxes and carry through the tests indicated there. At the end of the test, the trouble-shooting is continued at that point at which the shift was made previously.



J21

Poor throttle take-up
BMW 325e (USA)



J22

Poor throttle take-up
BMW 325e (USA)



Poor throttle take-up (continued)

yes

Check the secondary pattern for all cylinders.
Is the secondary pattern O.K.?

no

Check the ignition coil and the high voltage portion: is the distributor cap covered with oil on the outside and inside? (Unscrew the distributor rotor and check the camshaft seal).

Notes:

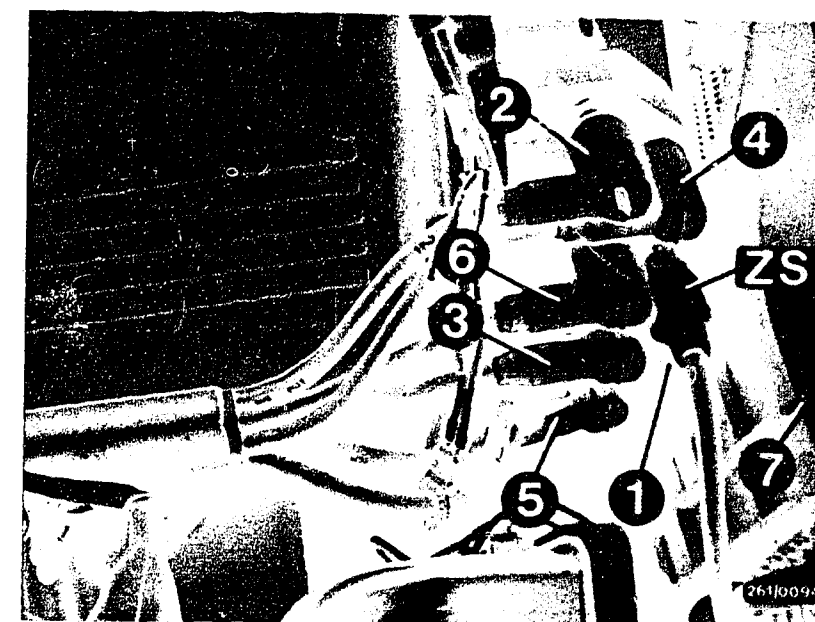
Distributor cap is fastened with 3 screws. To remove the distributor cap the cover of the radiator must be removed. When putting the ignition leads on, watch the cylinder numbers! Do not forget the cover and shielding cap! Check the primary ignition coil for continuity (approx. 0Ω). Secondary coil resistance: 5 to 7.2 k Ω . Check the interference suppression resistors, the ignition leads, and the spark plugs.

Interference-suppression resistance in

Ignition distributor rotor	1 k Ω
Ignition distributor housings:	each 1 k Ω
Spark-plug connectors:	each 5 k Ω
Spark plugs:	5 k Ω
Ignition coil:	1 k Ω

yes

Continued on K1/K2



High voltage distributor

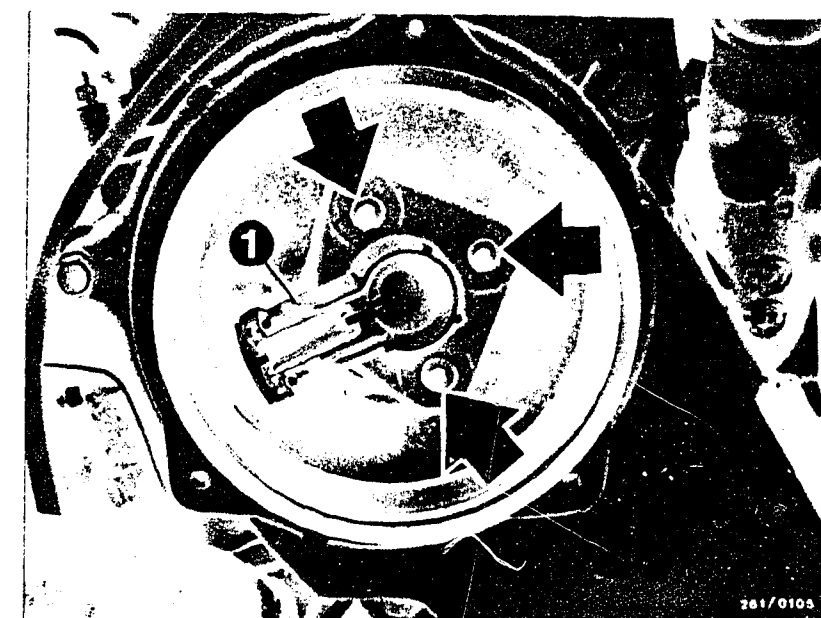
1 - 6 = Cylinder numbers

ZS = High voltage lead to the ignition coil

7 = Radiator cover

1 = Distributor rotor

Arrow = Fastening screws



J23

Poor throttle take-up
BMW 325e (USA)



J24

Poor throttle take-up
BMW 325e (USA)



Poor throttle take-up (continued)

yes

Is the throttle valve closed?

no

yes

Testing:

Find out whether the throttle valve can be closed even further, causing the engine speed to drop off.

Visual inspection:

Release the hose clamp and remove the hose at the throttle-valve assembly. Has the throttle valve been set for a gap? If need be, make the adjustment. After a correction, readjust the accelerator cable.

Adjustment of the throttle-valve switch:

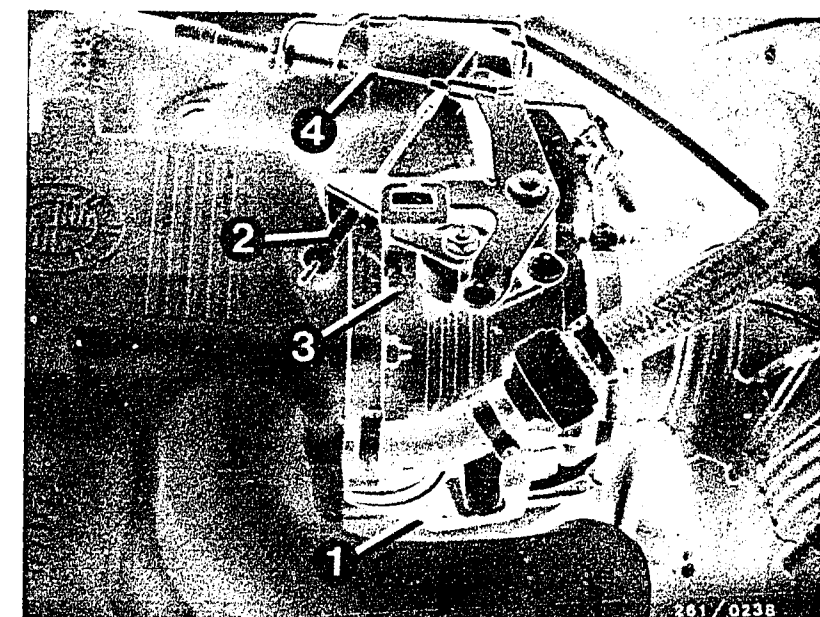
Release the fastening screws somewhat.

Connect an ohmmeter to the throttle-valve switch Term. 2 and ground. Turn the control lever to "full throttle" and slowly return it to the idle stop.

Turn the throttle-valve switch until the internal stop becomes perceptible. (Reading: 0Ω).

Checking the setting:

Pull on the accelerator cable somewhat. The idle contact must switch audibly. (Reading: $\infty\Omega$).



- 1 = Throttle-valve switch
- 2 = Accelerator cable
- 3 = Idle stop screw
- 4 = Cable to the automatic transmission

Continued on K3/K4

K1

Poor throttle take-up
BMW 325e (USA)



K2

Poor throttle take-up
BMW 325e (USA)



Poor throttle take-up (continued)

yes

Is the air-flow sensor O.K. mechanically?

no

Testing: Open the air-flow sensor flap by hand. It must be possible to open the sensor flap with uniform ease as far as the stop, and the flap must close again on its own as far as the stop. The air-flow sensor flap must not stick when opening. Watch for friction markings. If the air-flow sensor is severely fouled inside, clean it, and rub it out with a lint-free cloth. If there are friction markings present, the air-flow sensor must be taken out and replaced.

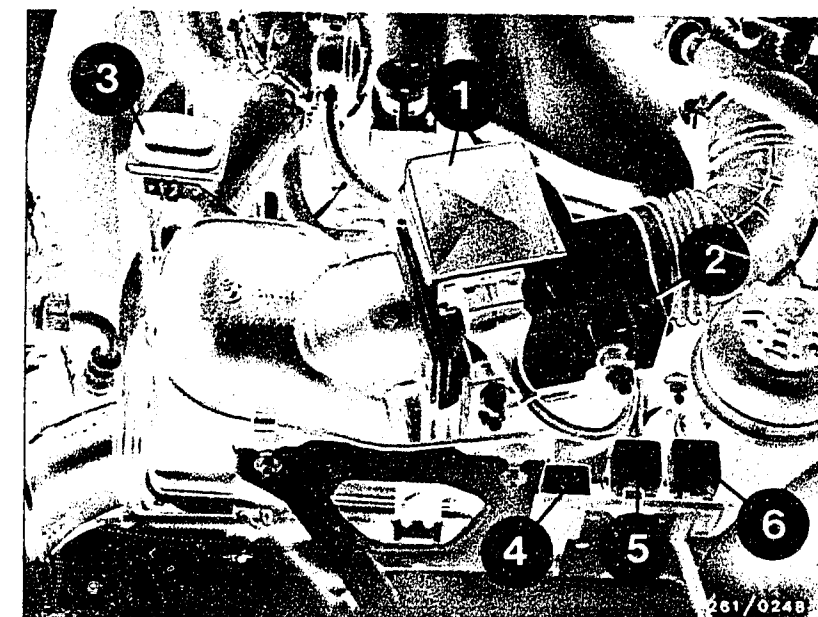
Potentiometer test (Noise test)

Take out the air-flow sensor. Leave the connecting plug plugged in. Set the motor tester at "special input" and connect the air-flow sensor Term. 7 (2)* (red clip) and Term. 6 (4)* (black clip). Set the control lever for adjustment of the picture on the motortester (calibrated setting). Switch on the ignition. Deflect the sensor flap of the air-flow sensor several times suddenly. If the air-flow sensor is good, a stroke signal without dips must appear on the oscilloscope. If the air-flow sensor is defective, a noise signal similar to the pattern shown at the right appears. Take out and replace the air-flow sensor. After testing, check the spring contacts for a tight seat.

(*) = New identification marking on the air-flow sensor.

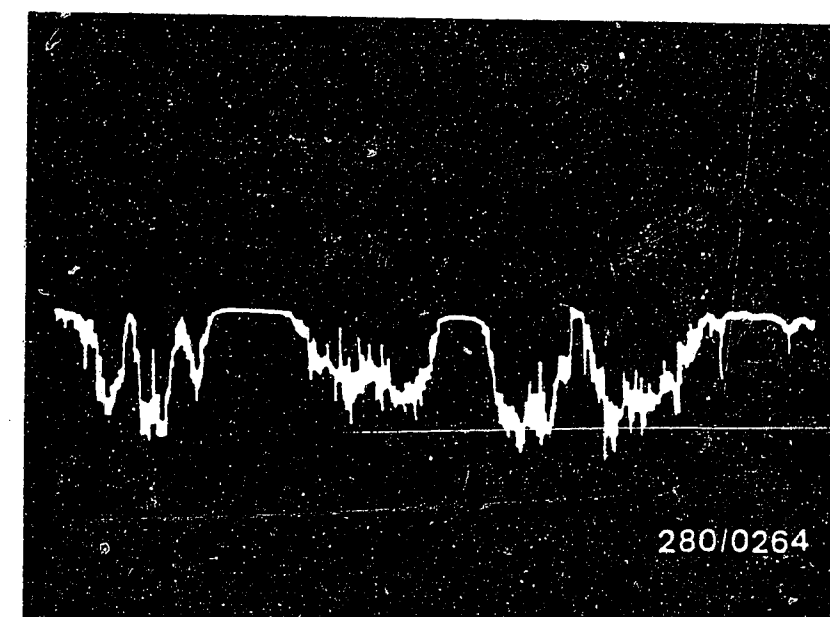
yes

Continued on K5/K6



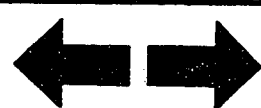
- 1 = Air-flow sensor with NTC I
2 = Idle-mixture -adjusting screw

Noise signal with defective air-flow sensor



K3

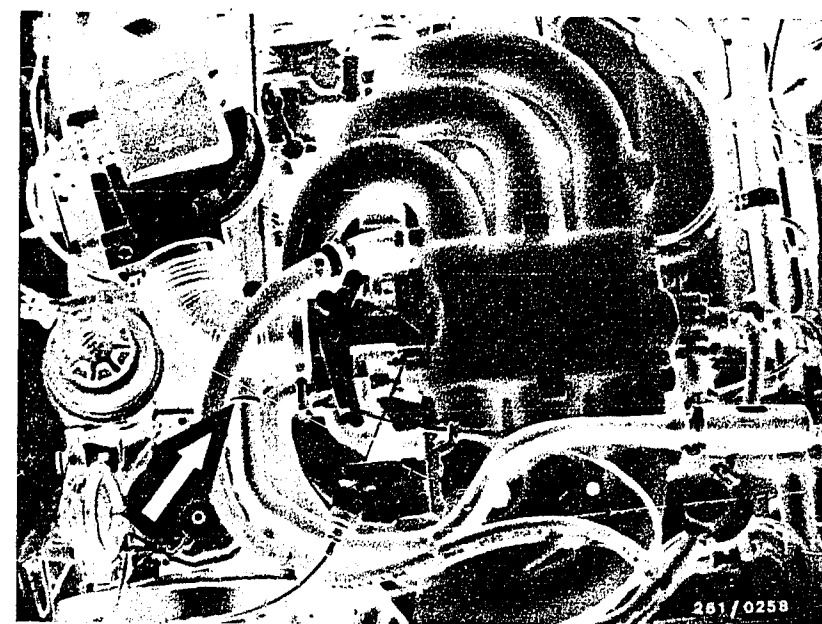
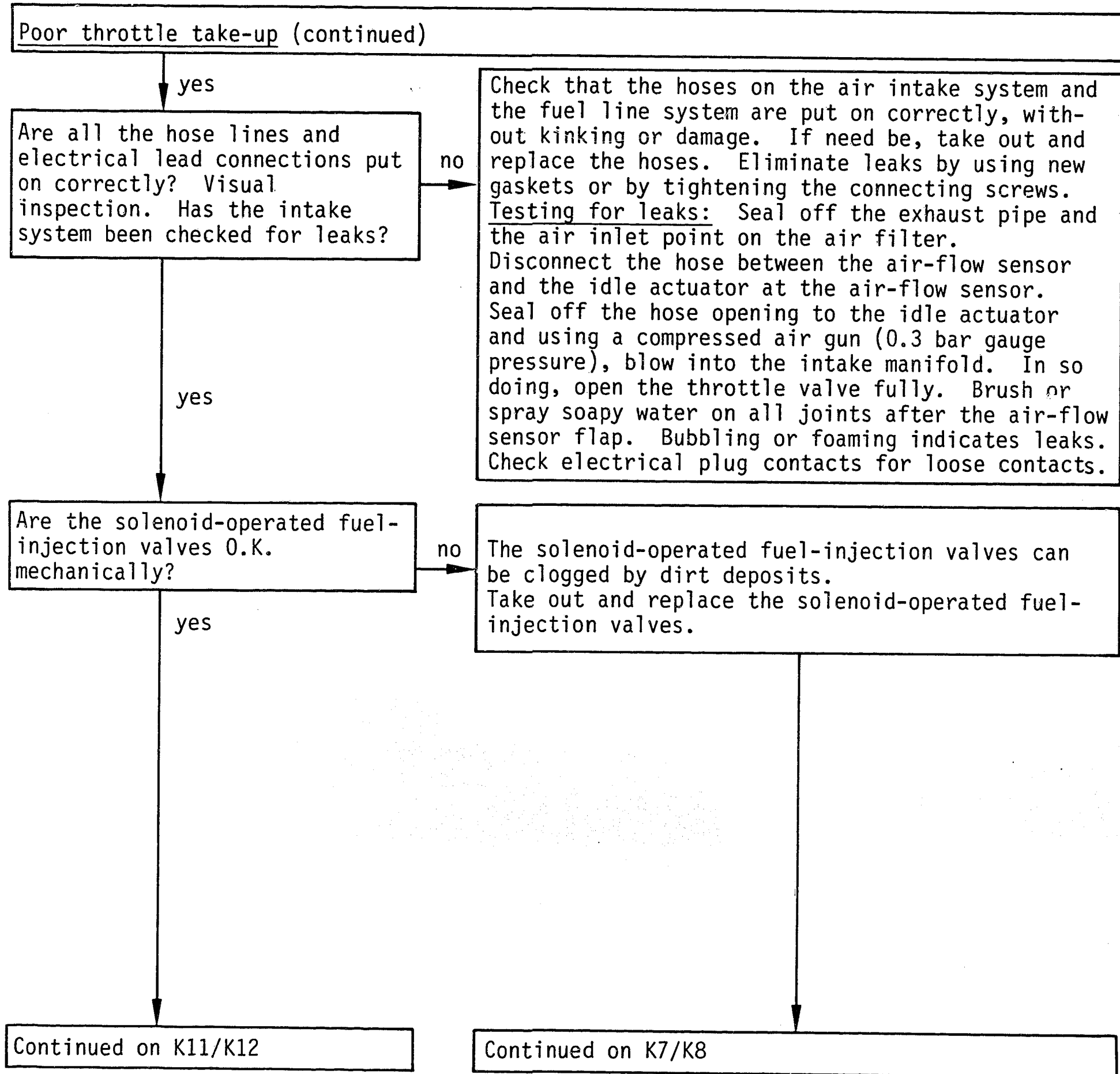
Poor throttle take-up
BMW 325e (USA)



K4

Poor throttle take-up
BMW 325e (USA)





Arrow = Disconnect hose here for leak test.

K5

Poor throttle take-up
BMW 325e (USA)



K6

Poor throttle take-up
BMW 325e (USA)



Poor throttle take-up (continued)

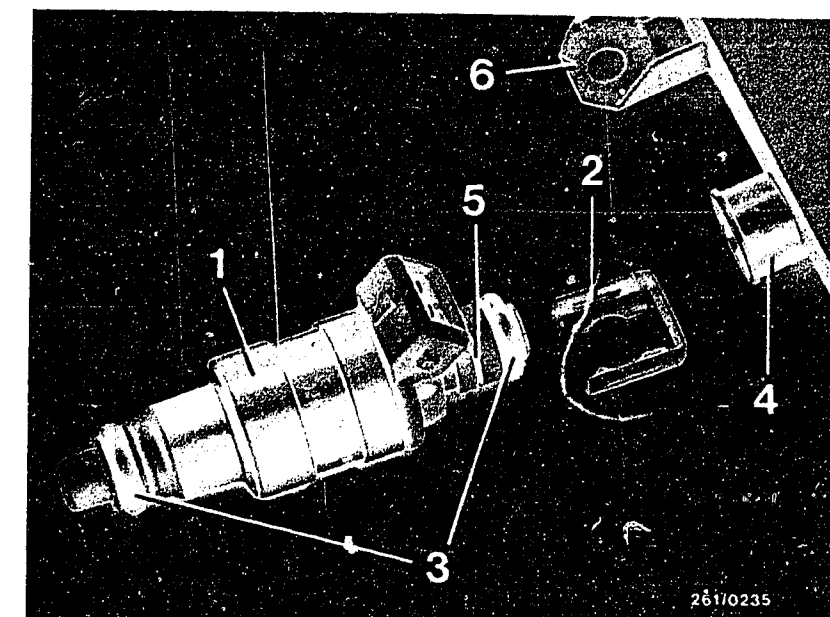
yes

Taking out the solenoid-operated fuel-injection valves
Release the fastening screws on the fuel distribution pipe. Pull the fuel distribution pipe up until the solenoid-operated fuel-injection valves are out of the hole in the intake manifold. Do not damage the nozzle needle or the rubber gasket. Check the nozzle needles and the area around them for tightness of seal and for dirt deposits. Disconnect the electrical connection. Carefully shove the holding bracket out of the slot and pull the solenoid-operated fuel-injection valve out of the fuel distribution pipe connection.

yes

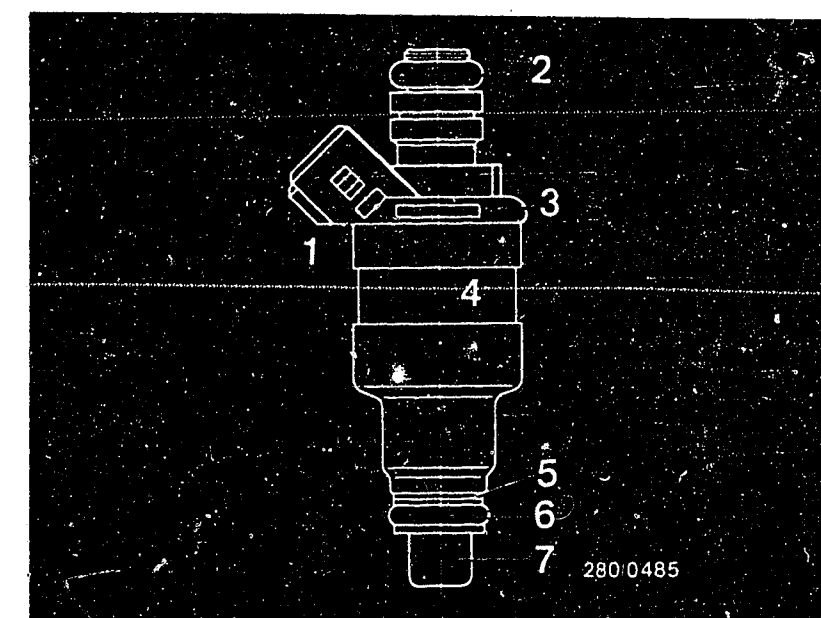
Continued on K11/K12

Continued on K9/K10



- 1 = Solenoid-operated fuel-injection valve
- 2 = Holding bracket
- 3 = Rubber gasket
- 4 = Fuel distribution pipe connection
- 5 = Slot
- 6 = Fastening tab

- 2 = Top O-ring
- 6 = Bottom O-ring
- 7 = Protection sleeve



K7

Poor throttle take-up
BMW 325e (USA)



K8

Poor throttle take-up
BMW 325e (USA)



Poor throttle take-up (continued)

yes

Caution!

Catch any fuel that runs out.
Do not allow it to drip on hot portions of the engine. Fire hazard!

Caution!

The protection sleeve must not be pried off.
Installation of the solenoid-operated fuel-injection valves

Take out and replace damaged or swollen O-rings.
Use set of parts 1 287 010 704.

Cut the lower O-ring (intake tube) into pieces.

Caution! Do not damage the protection sleeve.

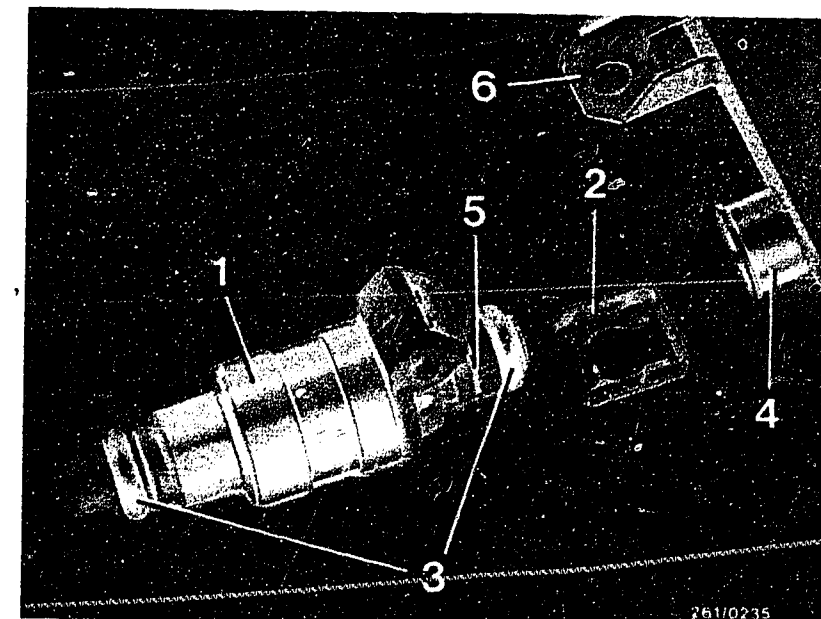
Pull a new O-ring over the protection sleeve and the shoulder on it. Do not damage any parts in so doing.

Before installation, check both rubber gaskets for proper seating. Fasten the solenoid-operated fuel-injection valves to the fuel distribution pipe.

All solenoid-operated fuel-injection valves are to be pressed into the seats at the same time using the fuel distribution pipe. Screw the fuel distribution pipe tight. Check all air and fuel hoses for proper seating.

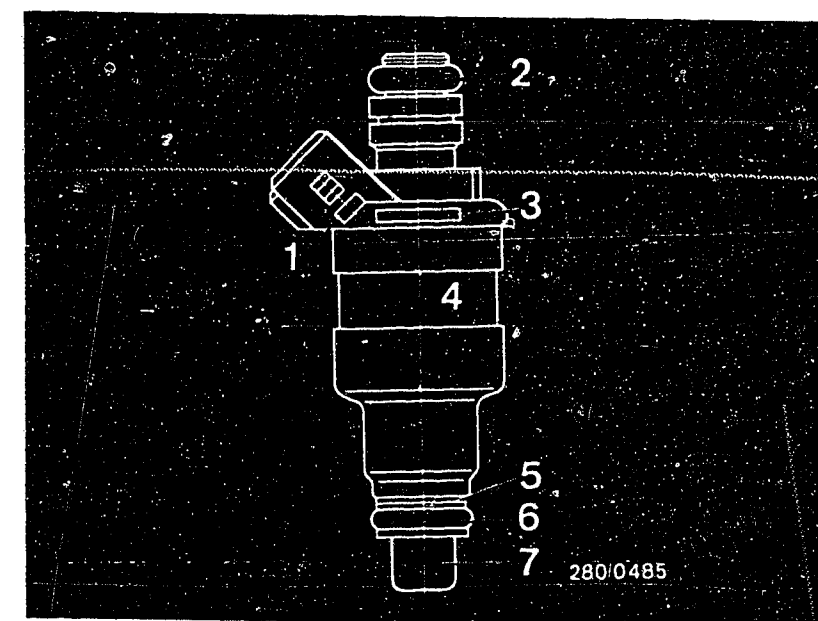
Make electrical connections.

Start the engine and check that no unmetered air is being drawn in.



- 1 = Solenoid-operated fuel-injection valve
- 2 = Holding bracket
- 3 = Rubber gasket
- 4 = Fuel distribution pipe connection
- 5 = Slot
- 6 = Fastening tab

- 2 = Top O-ring
- 6 = Bottom O-ring
- 7 = Protection sleeve



Continued on K11/K12

K9

Poor throttle take-up
BMW 325e (USA)



K10

Poor throttle take-up
BMW 325e (USA)



Poor throttle take-up (continued)

yes

Is the idle speed control (from VDO) O.K.?

no

If the engine hunts, take out and replace the idle speed control control unit (Figure at the top - Item 3). Measure the coil resistance of the idle actuator (Figure at center - Item 1): if there is a break or if the reading is 0Ω , the actuator is defective.

Measure the pulses on the actuator plug. Pulses must be visible on the oscilloscope at idle speed (Figure at the bottom). If there are no pulses: examine the power supply for the idle speed control control unit and/or take out and replace the idle speed control control unit.

Additional cause of defects:
The actuator is mechanically defective.

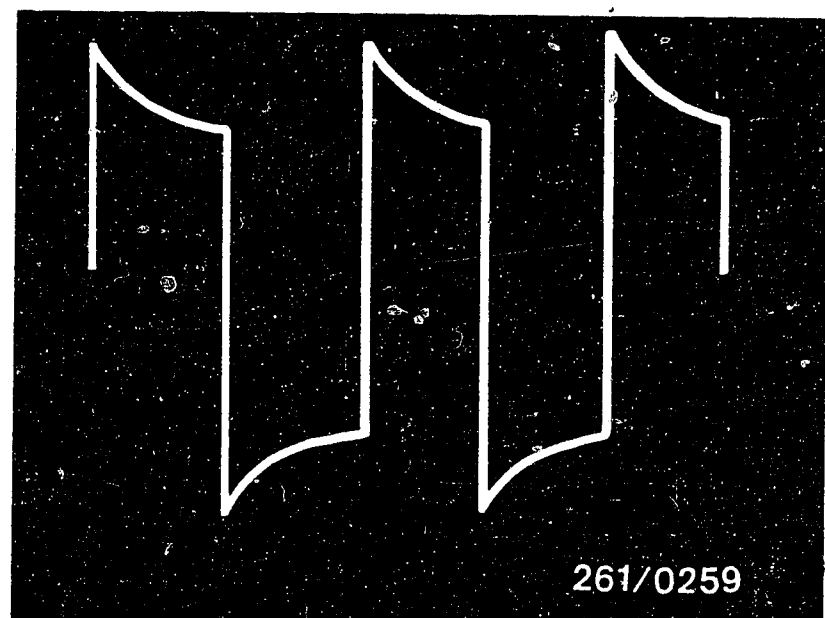
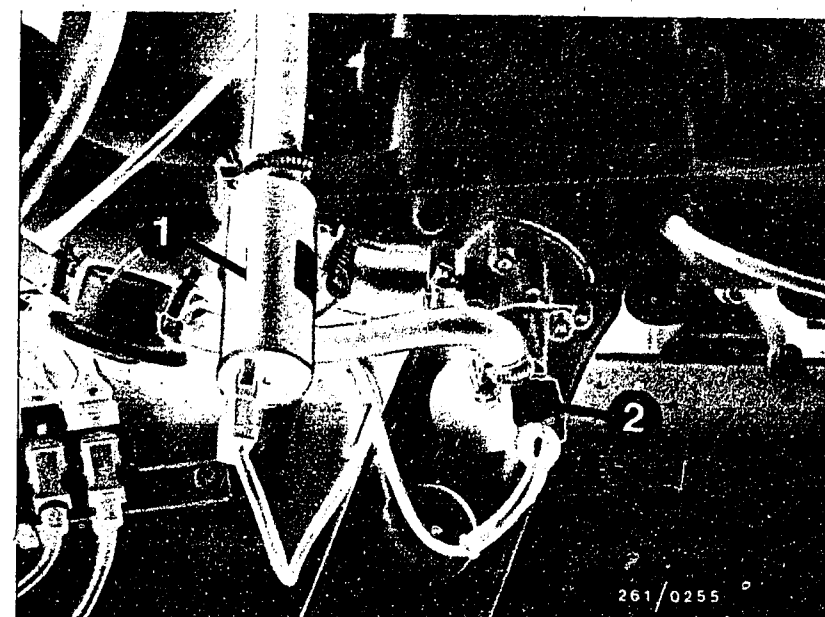
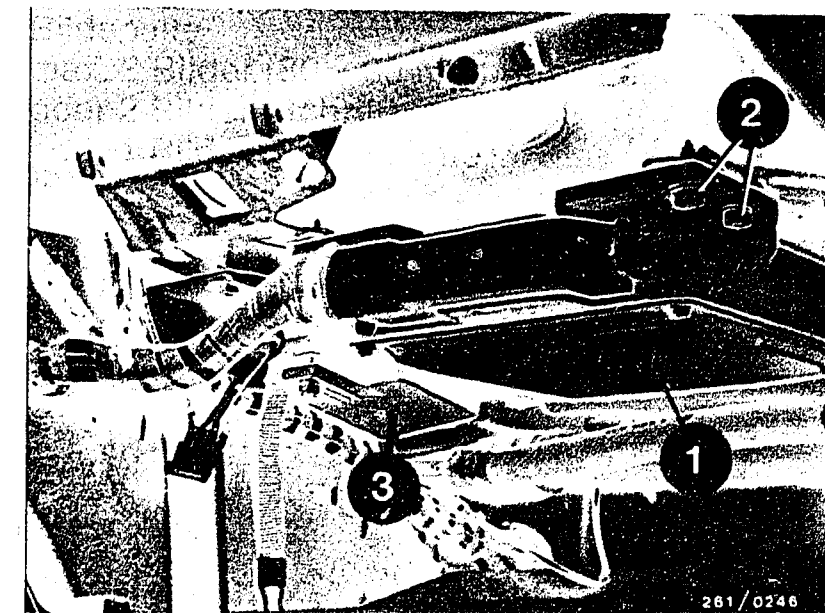
yes

Checking the customer complaint
"Poor throttle take-up"
has been completed.
Has the customer complaint been corrected?

no

Additional possible defects

- The customer complaint has been incorrectly identified. (See Coordinates C3 ... C10.) If the defect has not been identified using the "Targeted Trouble-Shooting", see "Detailed Trouble-Shooting" (Coordinates C3/C4).
- Engine is not O.K. mechanically. (Compression, valve setting, valve timing, wear on camshaft).



K11

Poor throttle take-up
BMW 325e (USA)



K12

Poor throttle take-up
BMW 325e (USA)



ENGINE MISSING IN ALL DRIVING CONDITIONS

Trouble-shooting program according to customer complaint

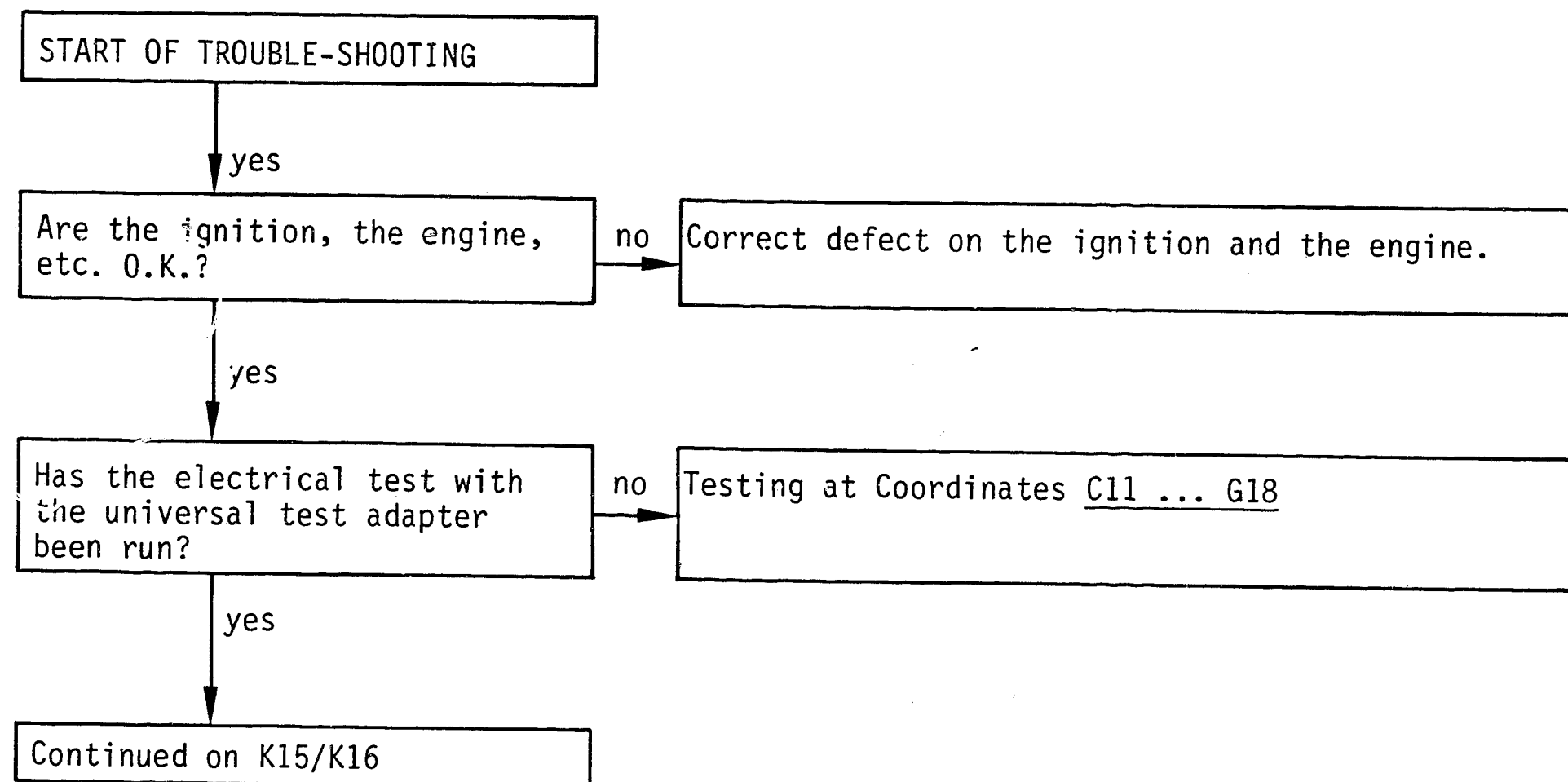
How to use program

Testing is organized into 3 columns of boxes:

- In the column at the left are the questions for the tests being run.
- In the column in the center the component tests and settings are described.
- The column at the right shows the figures belonging to the text and the legend for the figures.

If it is possible to answer the questions clearly with "yes" even without testing, proceed to the next question below.

On the other hand, if the answer to the question is "no", and a defect is suspected, you must switch to the center column of boxes and carry through the tests indicated there. At the end of the test, the trouble-shooting is continued at that point at which the shift was made previously.

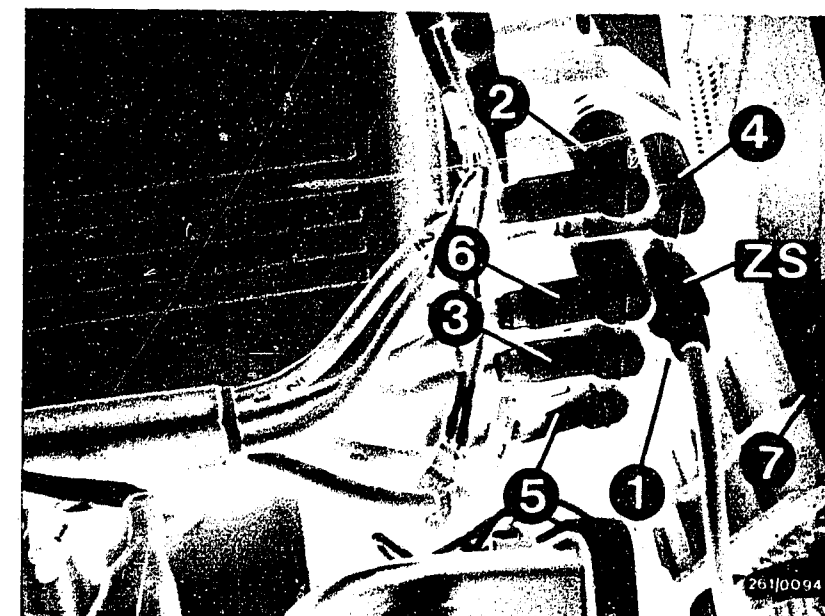
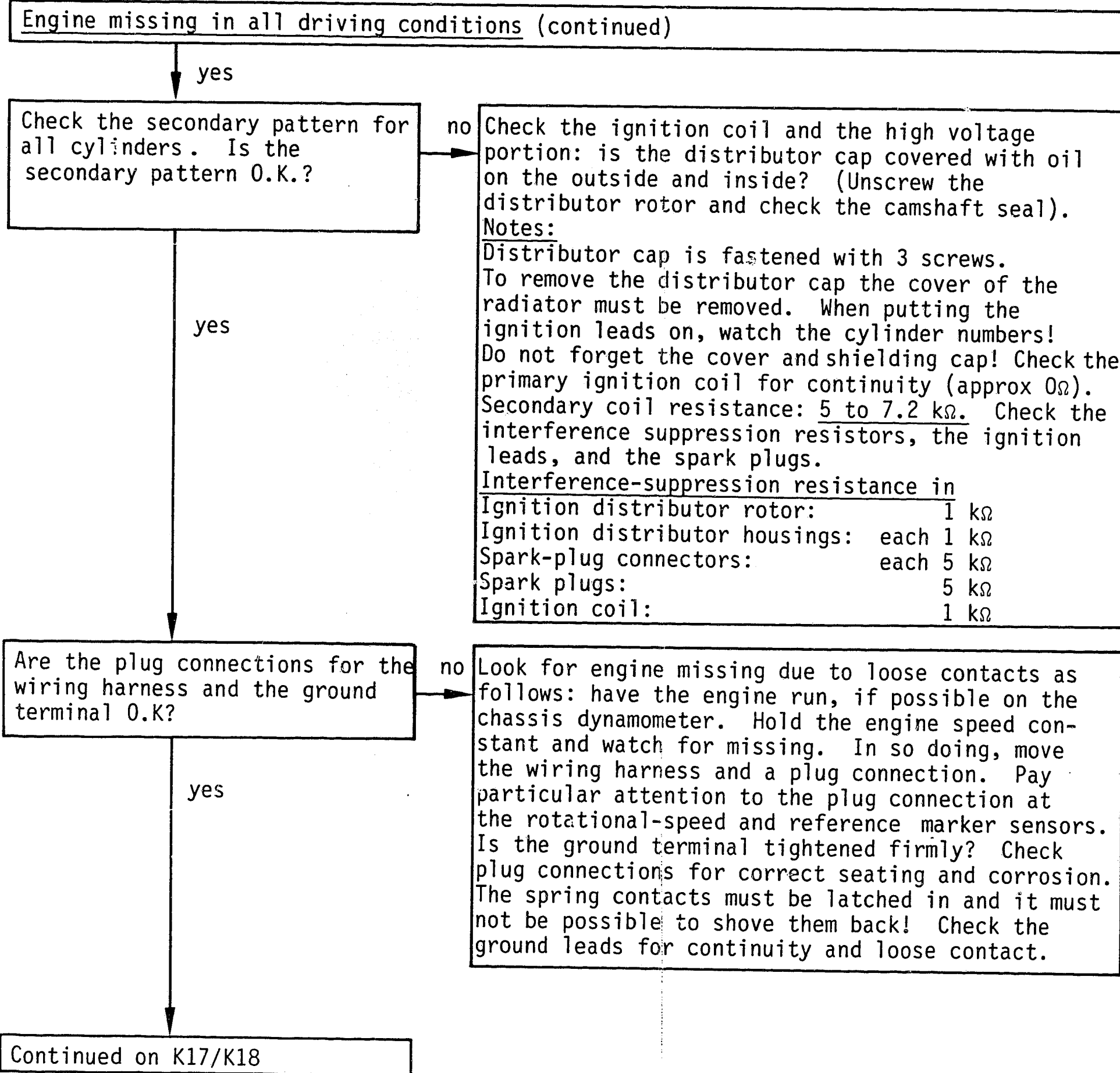
**K13**

Engine missing in all driving conditions
BMW 325e (USA)

**K14**

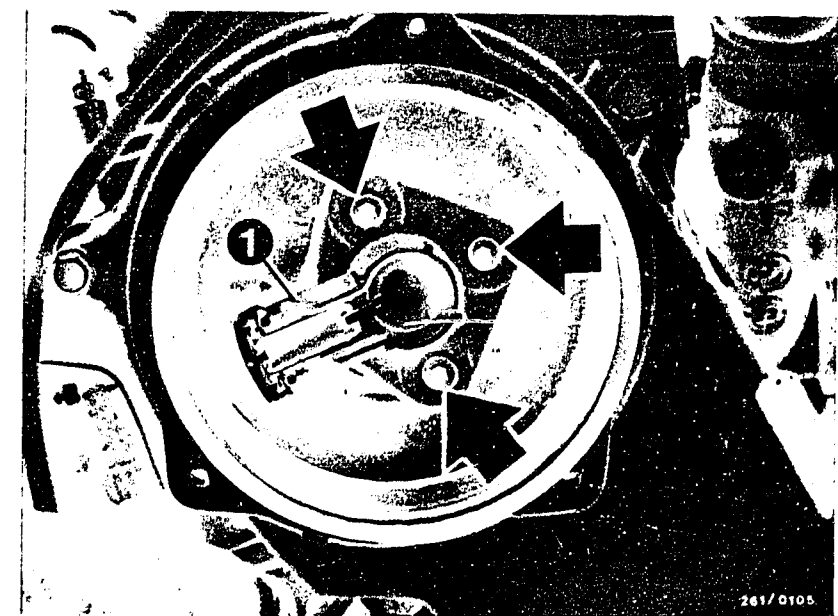
Engine missing in all driving conditions
BMW 325e (USA)





High voltage distributor
 1 - 6 = Cylinder numbers
 ZS = High voltage lead to the ignition coil
 7 = Radiator cover

1 = Distributor rotor
 Arrow = Fastening screws



K15

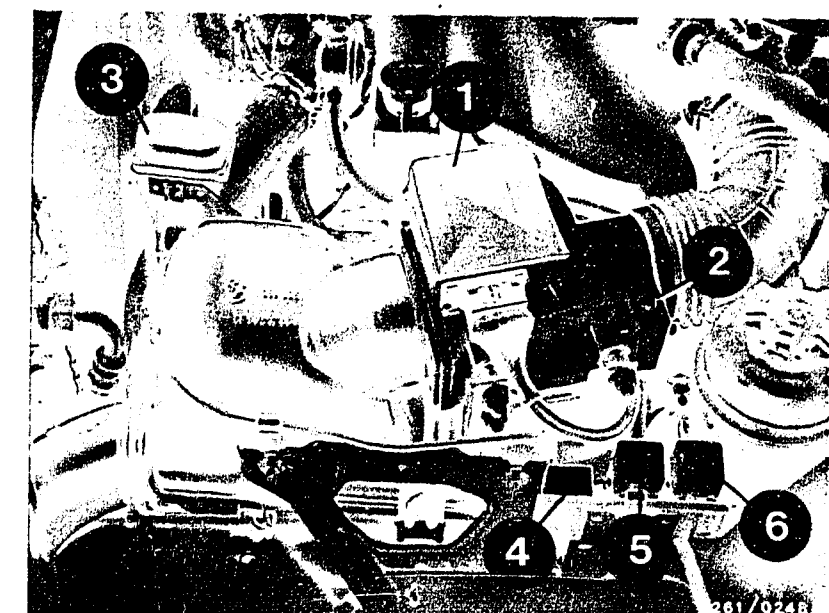
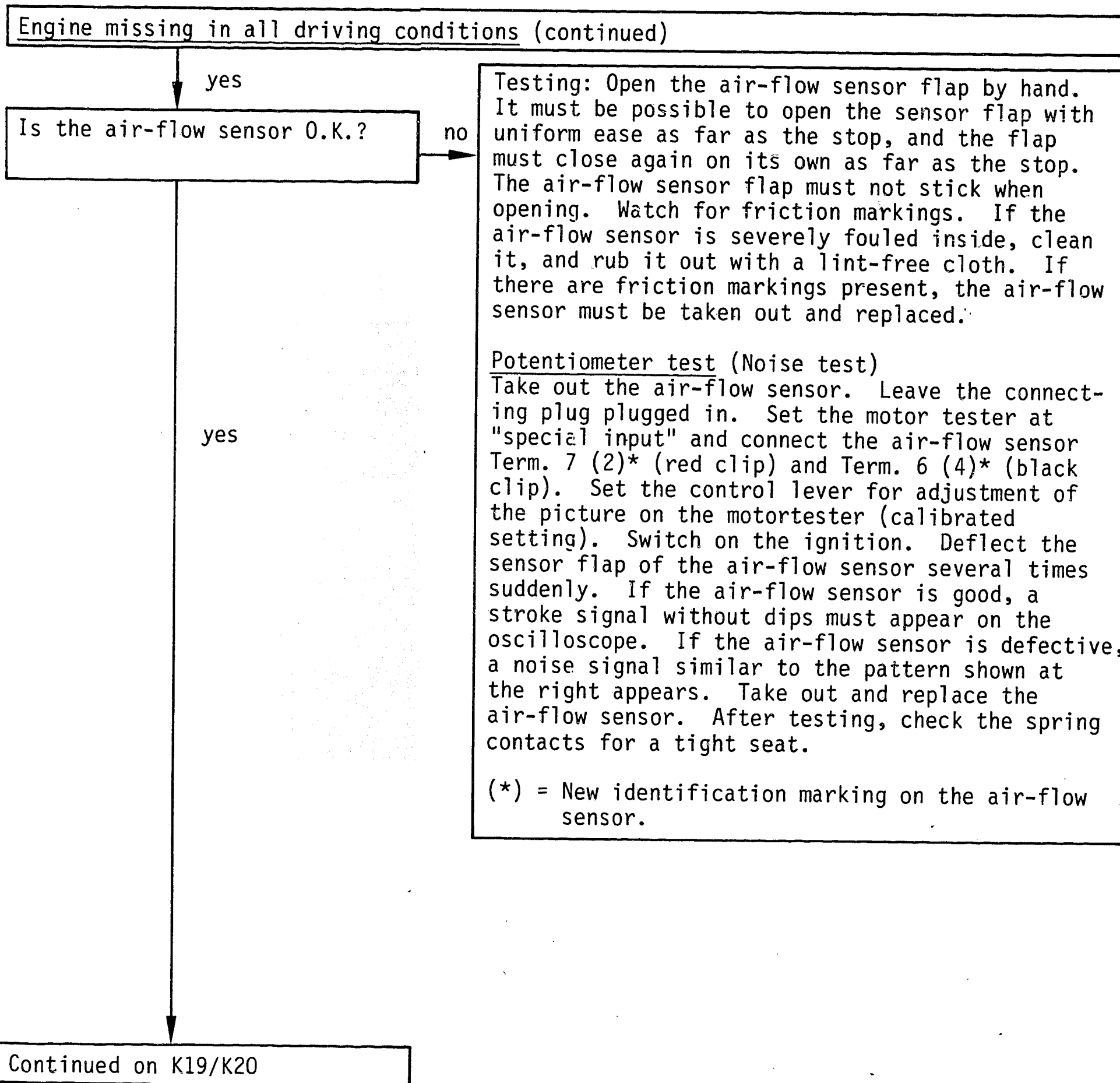
Engine missing in all driving conditions
 BMW 325e (USA)



K16

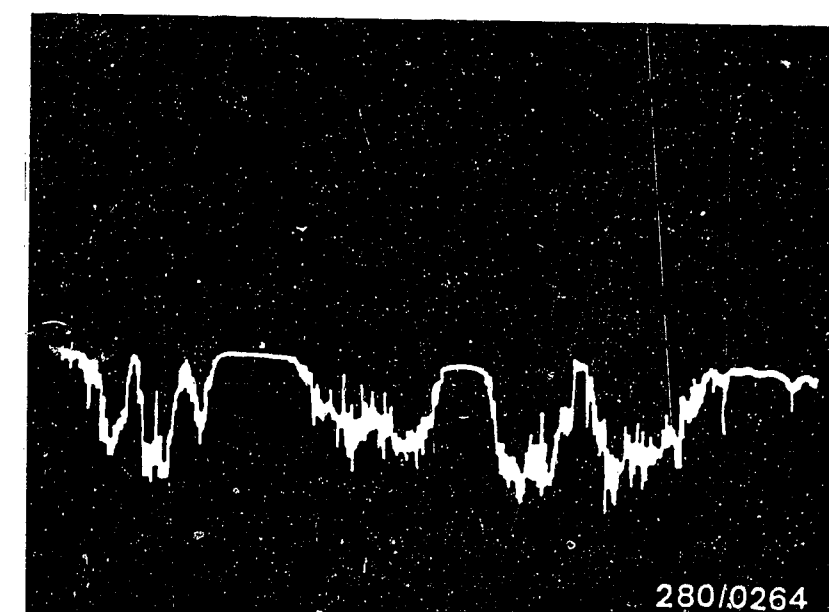
Engine missing in all driving conditions
 BMW 325e (USA)





- 1 = Air-flow sensor with NTC I
- 2 = Idle-mixture-adjusting screw

Noise signal with defective air-flow sensor



Engine missing in all driving conditions (continued)

yes

Is the fuel delivery O.K.?

no

yes

Measure the fuel delivery:

To test, release the connection between the fuel return hose (from the pressure regulator) and the fuel return line (to the fuel tank). If need be, extend the hose and direct into a 5 l container with a measuring scale. Build up the fuel pressure: on the universal test adapter, set the program switch "V" in setting 17. Switch the ignition on and press button T3.

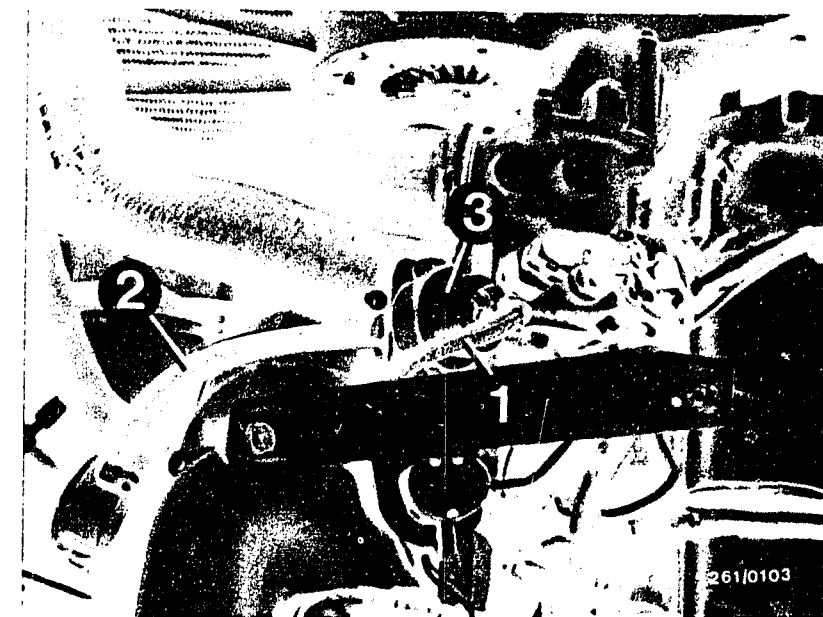
Test specification: min. 750 cm³/30 s

Corrective action if the specification is not attained.

- Fuel filter is clogged: take it out and replace it.
- Is the voltage at the fuel pump plugs min. 12 V with the engine running? If not, clean the contacts. Eliminate any poor ground connection. Take out and replace the leads.
- Check the pre-supply pump. Check by listening: Disconnect the connecting plug at the electric fuel pump. Build up the fuel pressure: on the universal test adapter, set the program switch "V" in setting 17. Switch the ignition on and press button T3. The pre-supply pump must run. If not, check the connecting leads and if need be, take out and replace the pre-supply pump.

yes

Continued on K21/K22



1 = Air hose

2 = Fuel return line

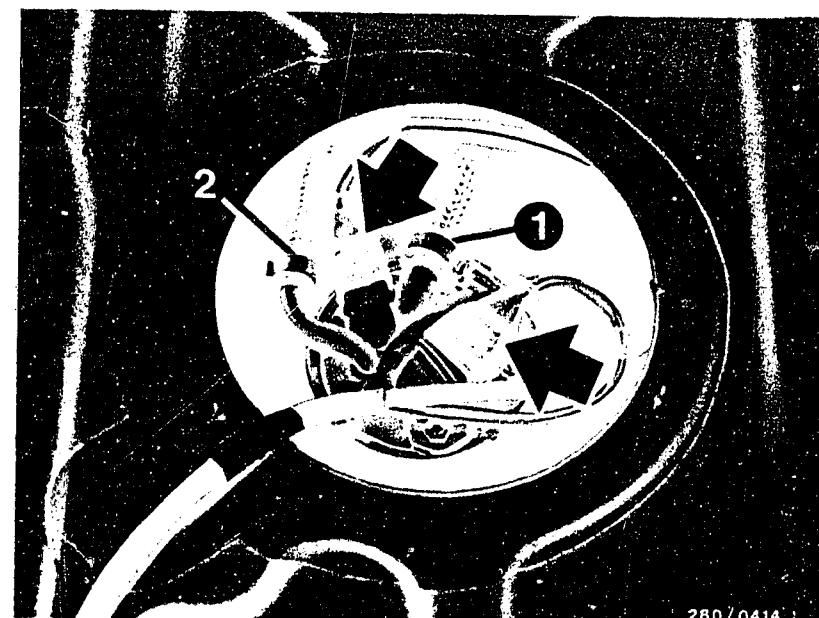
3 = Pressure regulator

Pre-supply pump: under the mat in the luggage compartment.

1 = Fuel delivery line to the electric fuel pump

2 = Fuel return line

Arrows = Connection plug, 2-pole; pre-supply pump, 3-pole, immersion tube sensor



K19

Engine missing in all driving conditions
BMW 325e (USA)



K20

Engine missing in all driving conditions
BMW 325e (USA)



Engine missing in all driving conditions (continued)

yes

- The fuel pressure regulator is defective: take it out and replace it. The fuel pressure regulator is fastened to the fuel distribution pipe using two fastening screws and across an O-ring. After the pressure regulator is taken out, the O-ring and the flat ring must be taken out and replaced. (Use set of parts 1 287 010 704).
- The fuel pump output is too low: take out and replace the fuel pump.
- Is the filter in the tank clogged? Is there corrosion in the tank?

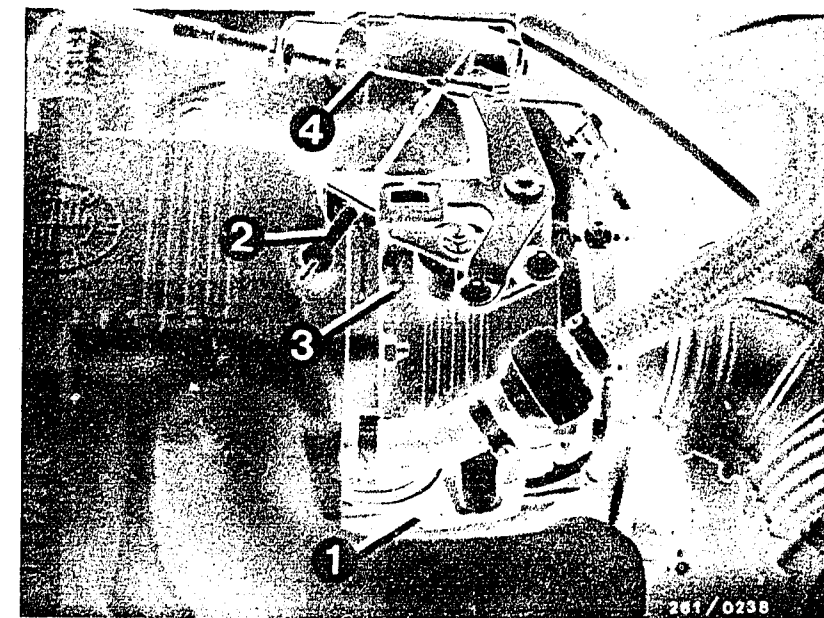
Does the engine cough on over-run?

no

1. Check the exhaust system for leaks.
2. Is the throttle valve closed?
Find out whether the throttle valve can be closed even further, causing the engine speed to drop off.
Visual inspection:
Release the hose clamp and remove the hose at the throttle-valve assembly. Has the throttle valve been set for a gap? If need be, make correction at the idle stop screw. After a correction, readjust the accelerator cable.

yes

Continued on K23/K24



- 1 = Throttle-valve switch
2 = Accelerator cable
3 = Idle stop screw
4 = Cable to the automatic transmission

K21

Engine missing in all driving conditions
BMW 325e (USA)



K22

Engine missing in all driving conditions
BMW 325e (USA)



Engine missing in all driving conditions (continued)

yes

Adjustment of the throttle-valve switch:
Release the fastening screws somewhat.
Connect an ohmmeter to the throttle-valve switch Term. 2 and ground. Turn the control lever to "full throttle" and slowly return it to the idle stop.
Turn the throttle-valve switch until the internal stop becomes perceptible. (Reading: 0Ω).

Checking the setting:
Pull on the accelerator cable somewhat. The idle contact must switch audibly. (Reading: $\infty\Omega$).

Arrow = Throttle-valve switch

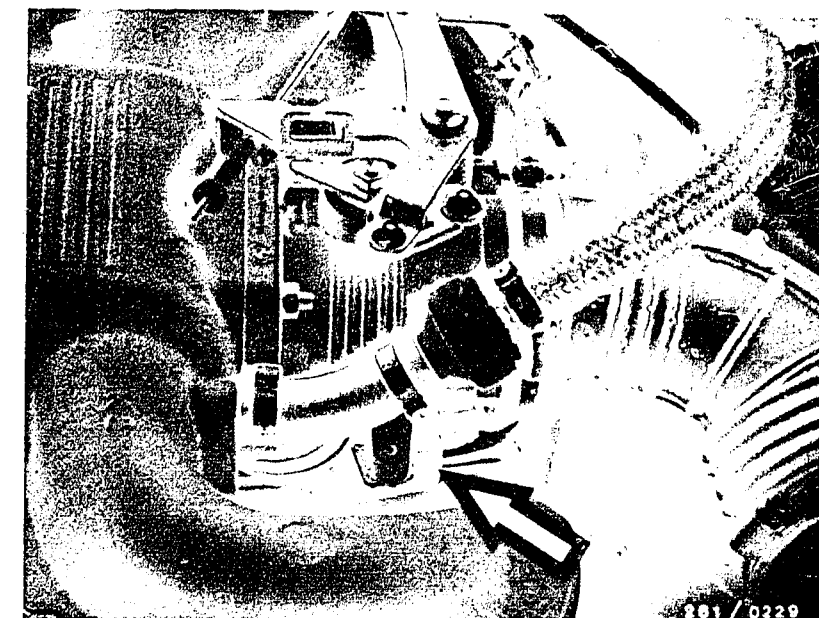
Is the control unit O.K.?

no

Have the engine run. Shake the control unit lightly and move the control unit plug. Watch for engine missing. Correct the plug connection on the control unit plug or take out and replace a defective control unit.

yes

Continued on L1/L2



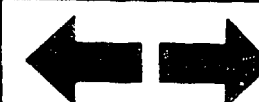
K23

Engine missing in all driving conditions
BMW 325e (USA)



K24

Engine missing in all driving conditions
BMW 325e (USA)



Engine missing in all driving conditions (continued)

yes

Is the alternator with regulator O.K.? (Engine missing due to voltage peaks).

no

Shut the engine off, disconnect the plug from the alternator. Start the engine. If the missing has been eliminated, check the alternator and the regulator. Using the universal test adapter (program switch "V" in setting 14), measure the fuel-injection signals on the oscilloscope with the engine running (pump relay plugged in). In so doing, watch for interference (voltage peaks, interference pulses).

yes

Has the full interference suppression equipment been installed? Check the interference suppression resistors. Measure the resistance. O.K.?

no

Correct the interference suppression.

Interference-suppression resistance in
Ignition distributor rotor: 1 k Ω
Ignition distributor housings: each 1 k Ω
Spark-plug connectors: each 5 k Ω
Spark plugs: 5 k Ω
Ignition coil: 1 k Ω

yes

Check the spark-plug connectors for burnt channels. O.K.?

no

Take out and replace the spark-plug connectors.

yes

Checking the customer complaint

"Engine missing in all driving conditions,"

has been completed.
Has the customer complaint been corrected?

no

Additional possible defects

- The customer complaint has been incorrectly identified. (See Coordinates C3 ... C10). If the defect has not been identified using the "Targeted Trouble-Shooting", see "Detailed Trouble-Shooting" (Coordinates C3/C4).
- Engine is not O.K. mechanically. (Compression, valve setting, valve timing, wear on camshaft).

L1

Engine missing in all driving conditions
BMW 325e (USA)



L2

Engine missing in all driving conditions
BMW 325e (USA)



POOR MILEAGE

Trouble-shooting program according to customer complaint

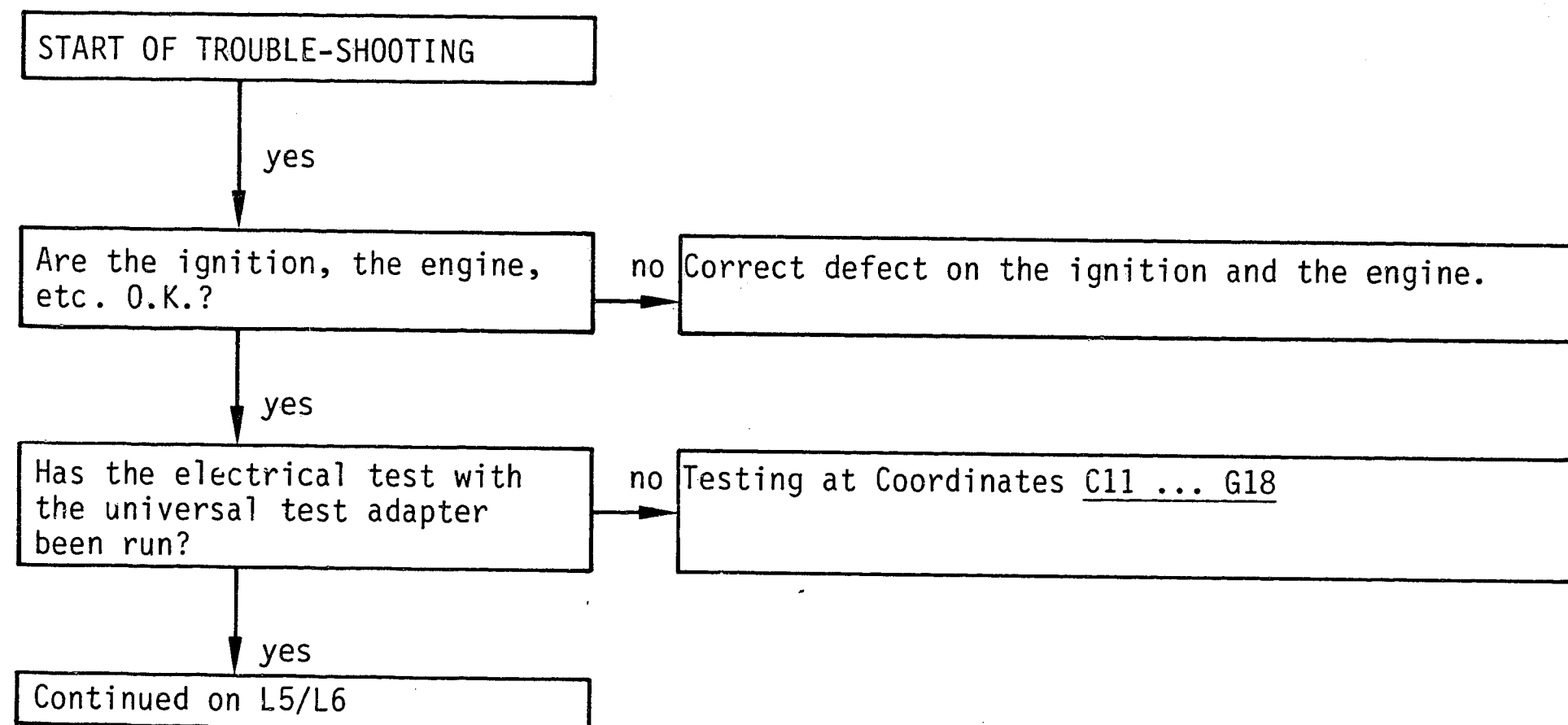
How to use the program

Testing is organized into 3 columns of boxes:

- In the column at the left are the questions for the test being run.
- In the column in the center the component tests and settings are described.
- The column at the right shows the figures belonging to the text and the legend for the figures.

If it is possible to answer the questions clearly with "yes" even without testing, proceed to the next question below.

On the other hand, if the answer to the question is "no", and a defect is suspected, you must switch to the center column of boxes and carry through the tests indicated there. At the end of the test, the trouble-shooting is continued at that point at which the shift was made previously.



L3

Poor mileage
BMW 325e (USA)



L4

Poor mileage
BMW 325e (USA)



Poor mileage (continued)

yes

Check the secondary pattern for all cylinders. Is the secondary pattern O.K.?

no

Check the ignition coil and the high voltage portion: is the distributor cap covered with oil on the outside and inside? (Unscrew the distributor rotor and check the camshaft seal.)

Notes:

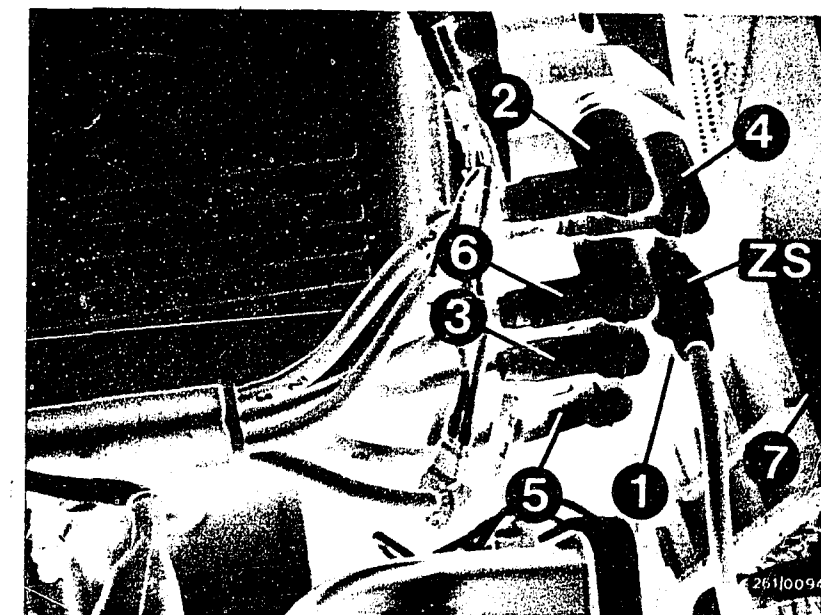
Distributor cap is fastened with 3 screws. To remove the distributor cap the cover of the radiator must be removed. When putting the ignition leads on, watch the cylinder numbers! Do not forget the cover and shielding cap! Check the primary ignition coil for continuity (approx. 0Ω). Secondary coil resistance: 5 to 7.2 k Ω . Check the interference suppression resistors, the ignition leads, and the spark plugs.

Interference-suppression resistance in

Ignition distributor rotor:	1 k Ω
Ignition distributor housings:	each 1 k Ω
Spark-plug connectors:	each 5 k Ω
Spark plugs:	5 k Ω
Ignition coil:	1 k Ω

yes

Continued on L7/L8



High voltage distributor

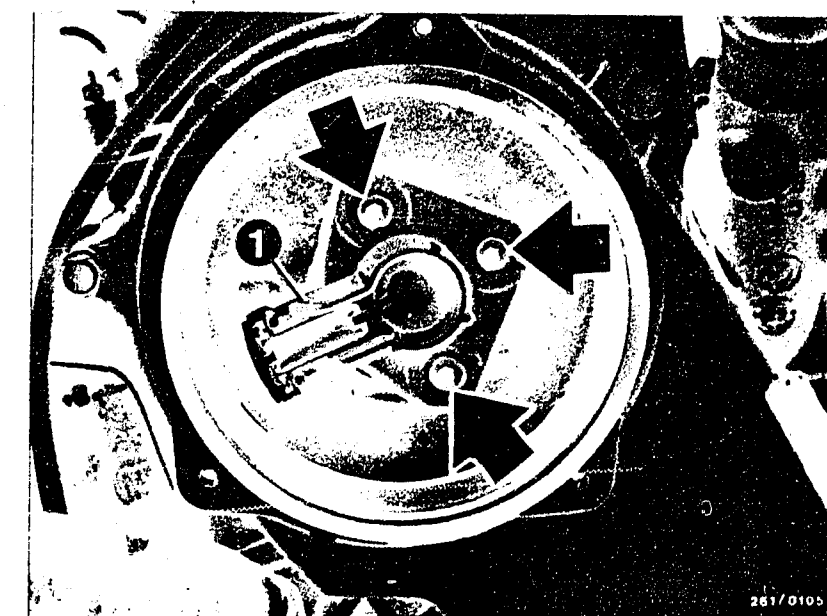
1 - 6 = Cylinder numbers

ZS = High voltage lead to the ignition coil

7 = Radiator cover

1 = Distributor rotor

Arrow = Fastening screws



L5

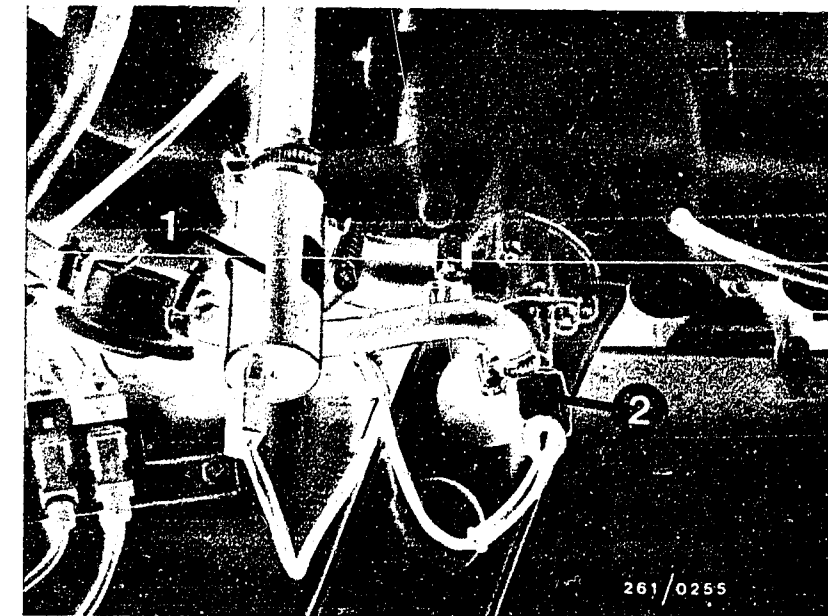
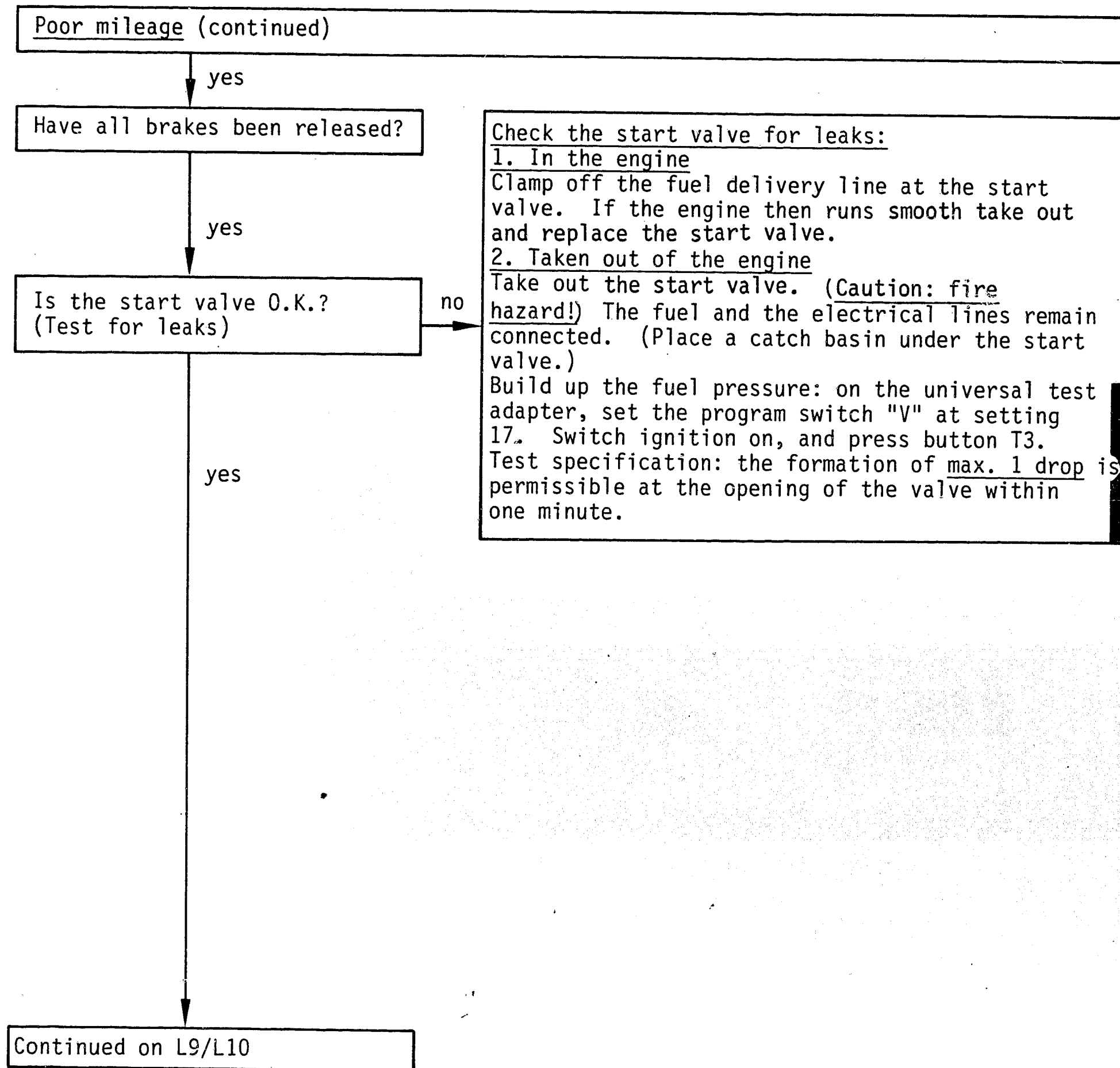
Poor mileage
BMW 325e (USA)



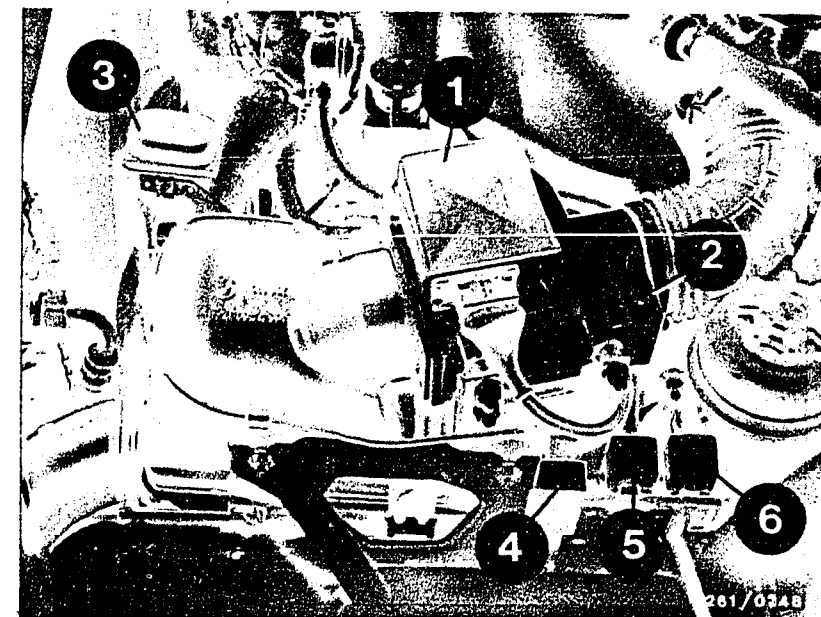
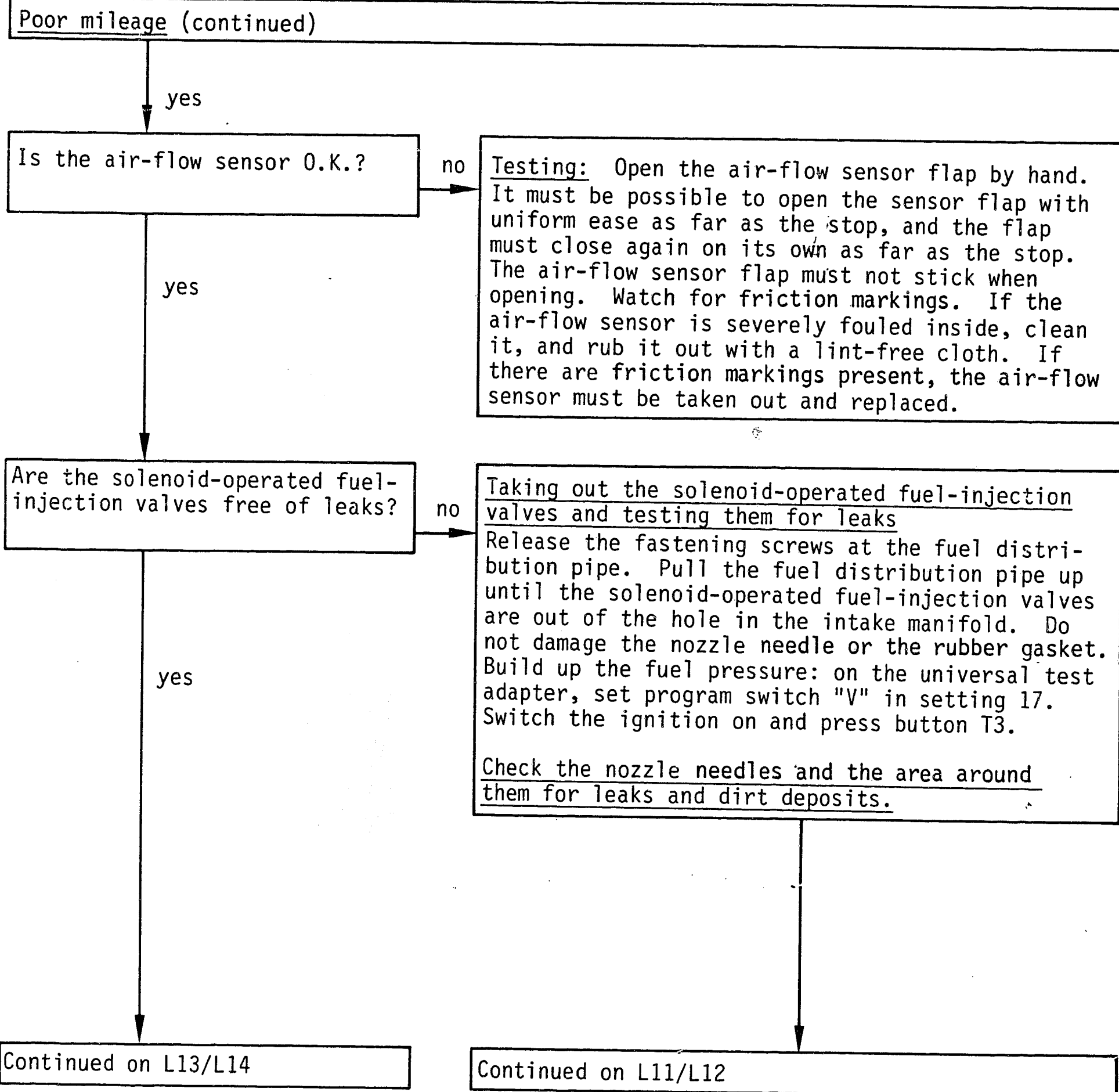
L6

Poor mileage
BMW 325e (USA)



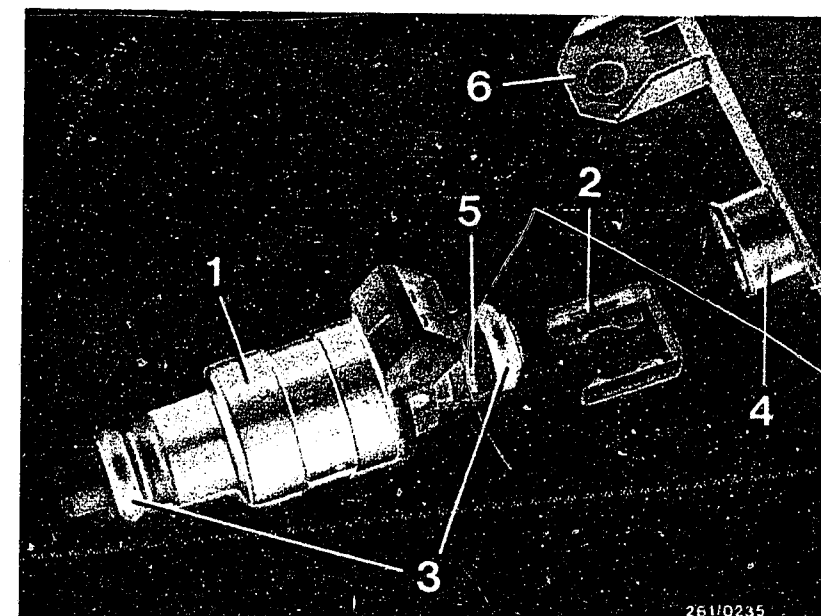


1 = Idle actuator
2 = Start valve



1 = Air-flow sensor with NTC I
2 = Idle-mixture-adjusting screw

1 = Solenoid-operated fuel-injection valve
2 = Holding bracket
3 = Rubber gasket (O-ring)
4 = Fuel distribution pipe connection
5 = Slot
6 = Fastening tab



L9

Poor mileage
BMW 325e (USA)



L10

Poor mileage
BMW 325e (USA)



Poor mileage (continued)

yes

Disconnect the electrical connection.

Shove the holding bracket carefully out of the slot and pull the solenoid-operated fuel-injection valve out of the fuel distribution pipe connection. **Caution!**

Catch any fuel that runs out. Do not allow it to drip on hot portions of the engine. Fire hazard! **Caution!**

Caution!

The protection sleeve must not be pried off.

Installation of the solenoid-operated fuel-injection valves

Take out and replace damaged or swollen O-rings. Use set of parts 1 287 010 704.

Cut the lower O-ring (intake tube) into pieces.

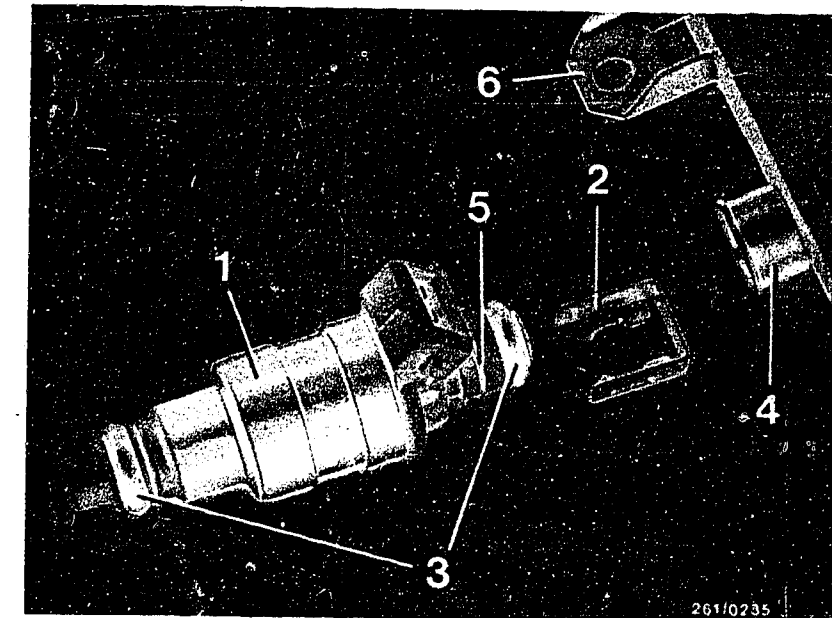
Caution! Do not damage the protection sleeve.

Pull a new O-ring over the protection sleeve and the shoulder on it. Do not damage any parts in so doing.

Before installation, check both rubber gaskets for proper seating. Fasten the solenoid-operated fuel-injection valves to the fuel distribution pipe. All solenoid-operated fuel-injection valves are to be pressed into the seats at the same time using the fuel distribution pipe. Screw the fuel distribution pipe tight. Check all air and fuel hoses for proper seating.

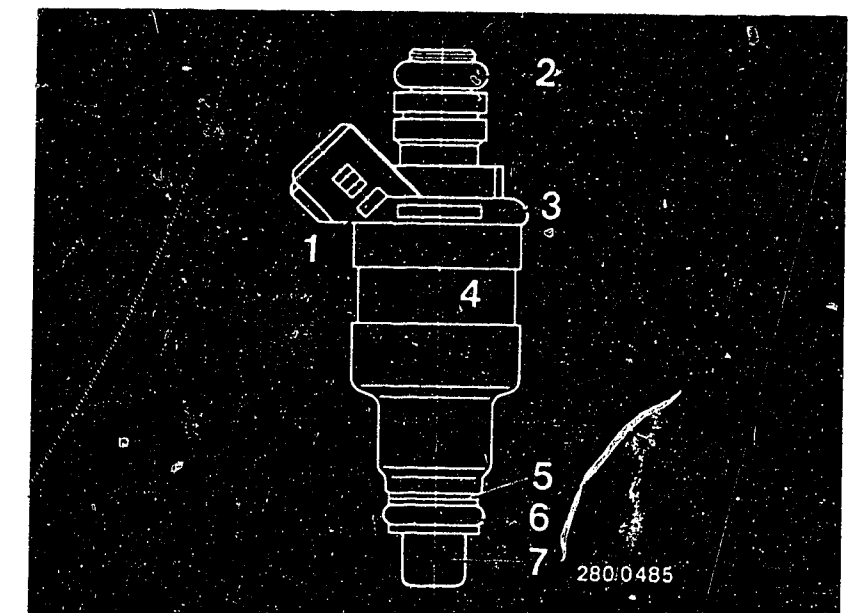
Make electrical connections.

Start the engine and check that no unmetered air is being drawn in.



- 1 = Solenoid-operated fuel-injection valve
- 2 = Holding bracket
- 3 = Rubber gasket
- 4 = Fuel distribution pipe connection
- 5 = Slot
- 6 = Fastening tab

- 2 = Top O-ring
- 6 = Bottom O-ring
- 7 = Protective sleeve



Continued on L13/L14

L11

Poor mileage
BMW 325e (USA)



L12

Poor mileage
BMW 325e (USA)



Poor mileage (continued)

yes

Idle speed with engine at normal operating temperature:
650 ... 750 min⁻¹

Measure the exhaust gas value with the engine at normal operating temperature in front of the catalytic converter:
0.5 ... 0.8 vol. %CO

Before testing, disconnect the hose to the activated carbon filter, switch off the loads, and take apart the lambda sensor plug connection.

no

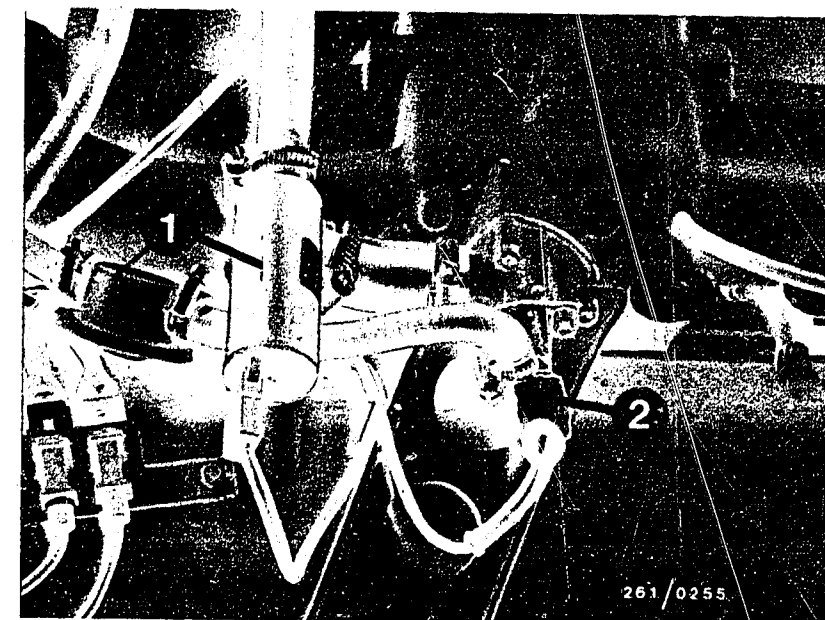
- The idle speed cannot be adjusted. It is permanently set in the idle speed control control unit, and is determined by the idle actuator.
- Adjust the exhaust gas using the idle-mixture-adjusting screw in the air-flow sensor. To do so, remove the plug using the special tool.

If the CO cannot be adjusted:

- If the CO-level is too low: repeat the leak test on the intake system.
- If the CO-level is too high: take out and replace the air-flow sensor.

Note:

After adjusting the CO-level, insert a new plug into the air-flow sensor.



1 = Idle actuator
2 = Start valve

yes

Checking the customer complaint

"Poor mileage"

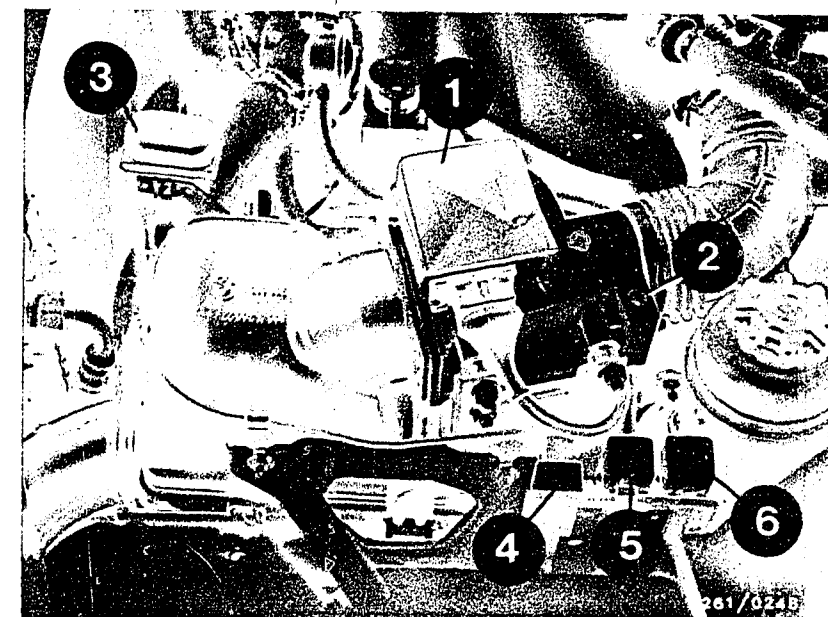
has been completed.
Has the customer complaint been corrected?

no

Additional possible defects

- The customer complaint has been incorrectly identified. (See Coordinates C3 ... C10.) If the defect has not been identified using the "Target Trouble-Shooting", see "Detailed Trouble-Shooting" (Coordinates C3/C4).
- Engine is not O.K. mechanically. (Compression, valve setting, valve timing, wear on camshaft).

1 = Air-flow sensor with NTC 1
2 = Idle-mixture-adjusting screw



L13

Poor mileage
BMW 325e (USA)



L14

Poor mileage
BMW 325e (USA)



NO MAX. ENGINE POWER, AND/OR MAX. VELOCITY

Trouble-shooting program according to customer complaint

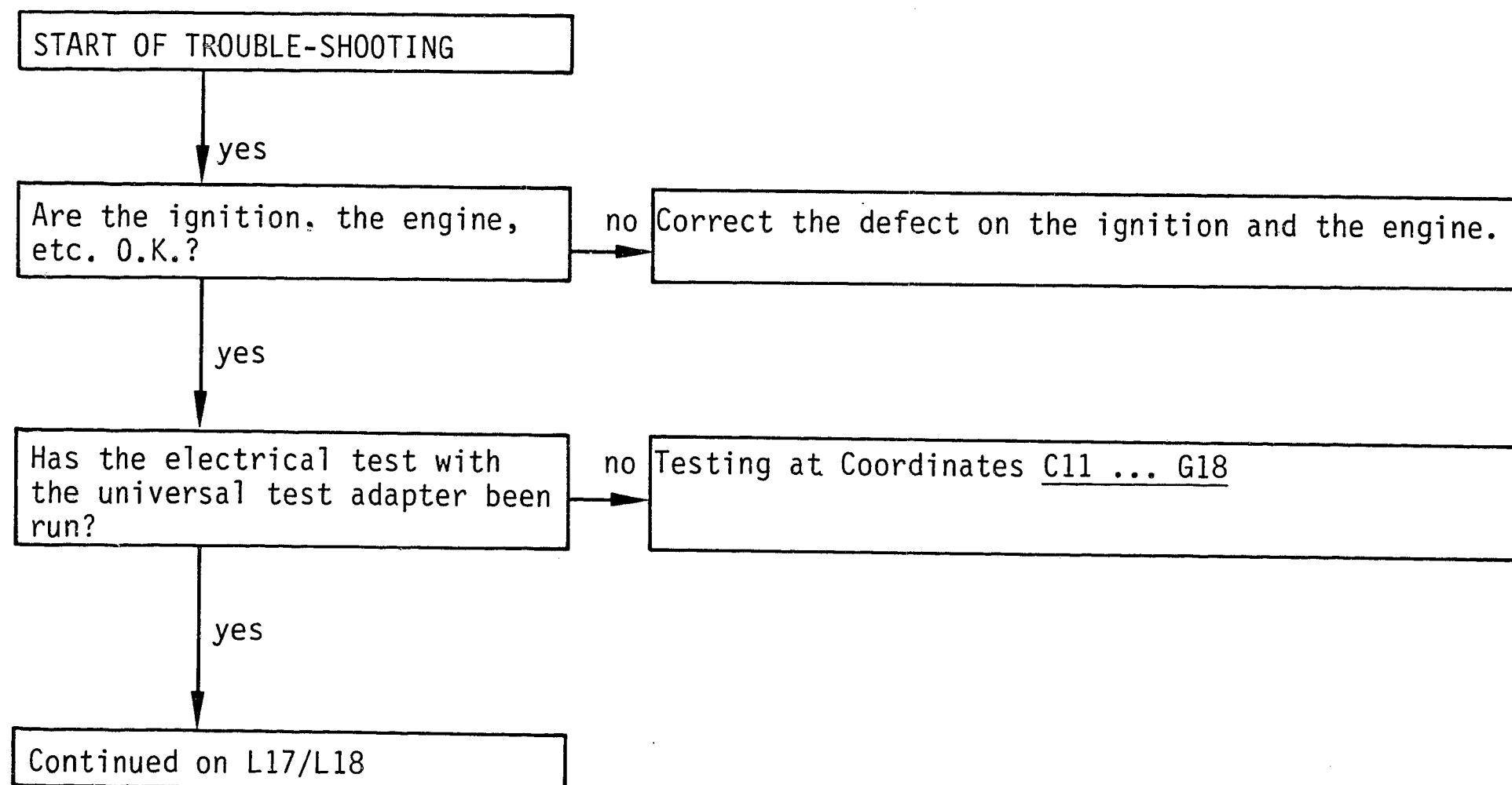
How to use the program

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- In the column in the center the component tests and settings are described.
- The column at the right shows the figures belonging to the text and the legend for the figures.

If it is possible to answer the questions clearly with "yes" even without testing, proceed to the next question below.

On the other hand, if the answer to the question is "no", and a defect is suspected, you must switch to the center column of boxes and carry through the tests indicated there. At the end of the test, the trouble-shooting is continued at that point at which the shift was made previously.



L15

No max. engine power
BMW 325e (USA)



L16

No max. engine power
BMW 325e (USA)



No max. engine power and/or max. velocity (continued)

yes

Check the secondary pattern for all cylinders. Is the secondary pattern O.K.?

no

Check the ignition coil and the high voltage portion: is the distributor cap covered with oil on the outside and inside? (Unscrew the distributor rotor and check the camshaft seal.)

Notes:

Distributor cap is fastened with 3 screws. To remove the distributor cap the cover of the radiator must be removed. When putting the ignition leads on, watch the cylinder numbers! Do not forget the cover and shielding cap! Check the primary ignition coil for continuity (approx. 0Ω). Secondary coil resistance: 5 to 7.2 k Ω . Check the interference suppression resistors, the ignition leads and the spark plugs.

Interference-suppression resistance in

Ignition distributor rotor:	1 k Ω
Ignition distributor housings:	each 1 k Ω
Spark-plug connectors:	each 5 k Ω
Spark plugs:	5 k Ω
Ignition coil:	1 k Ω

yes

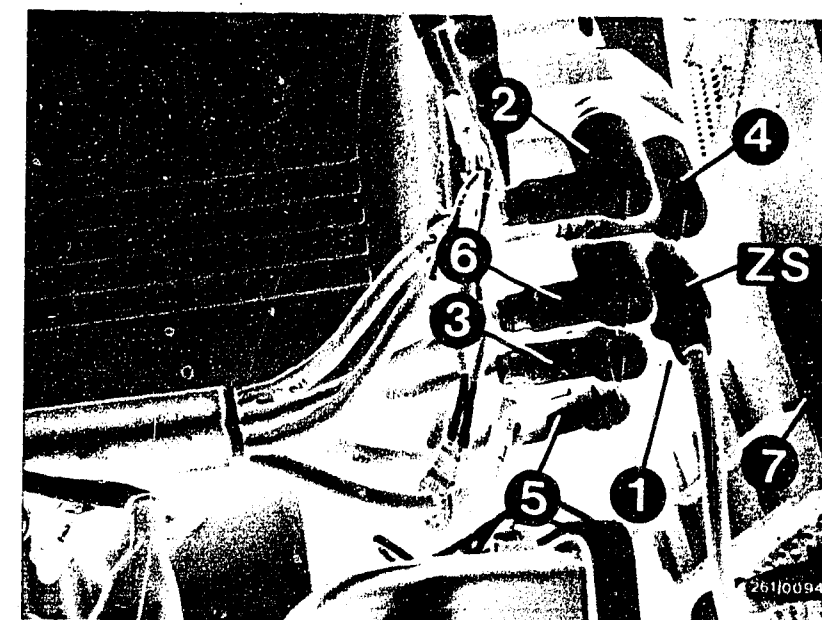
Does the throttle valve open fully?

no

Are the accelerator cable, the accelerator pedal O.K.? The accelerator pedal can jam due to the floor carpeting, etc. Adjust the accelerator cable. Check the pressure point for "kick-down".

yes

Continued on L19/L20



High voltage distributor

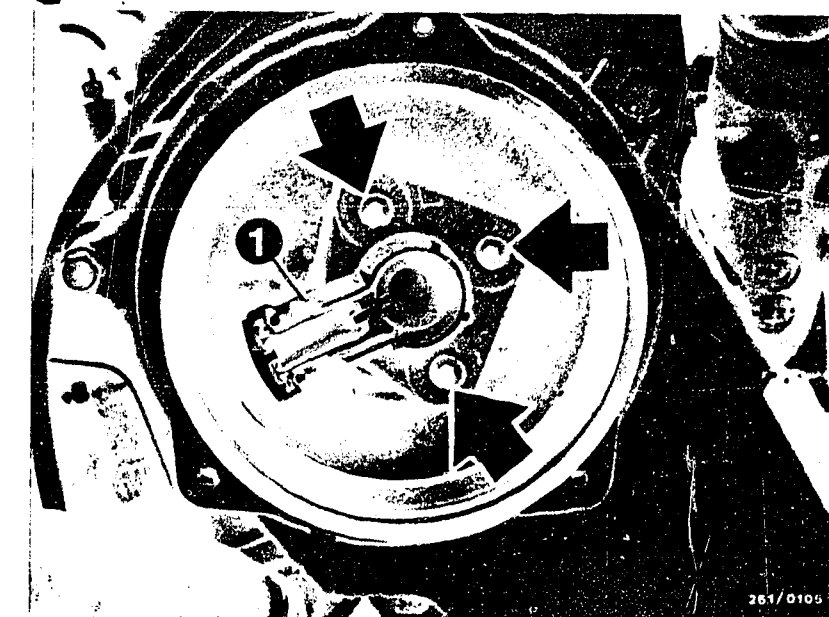
1 - 6 = Cylinder numbers

ZS = High voltage lead to the ignition coil

7 = Radiator cover

1 = Distributor rotor

Arrow = Fastening screws



L17

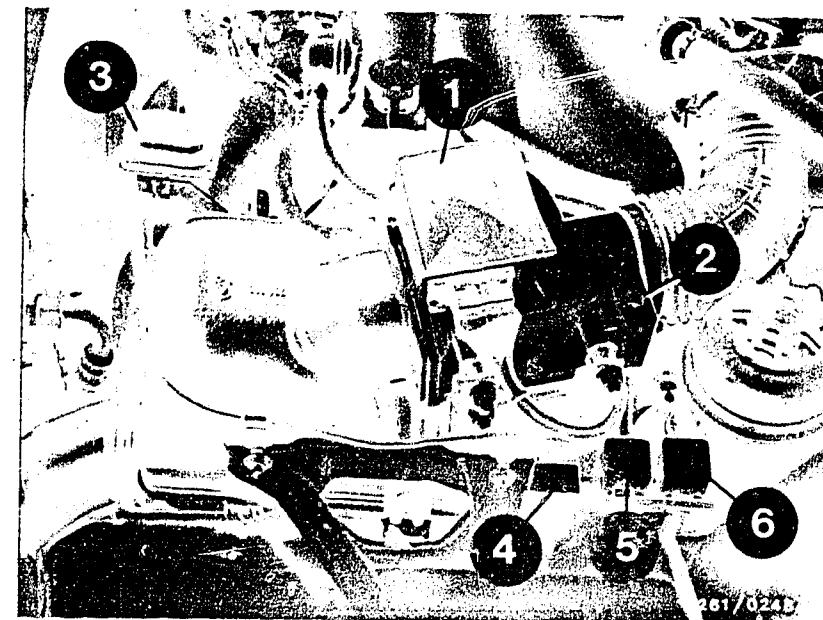
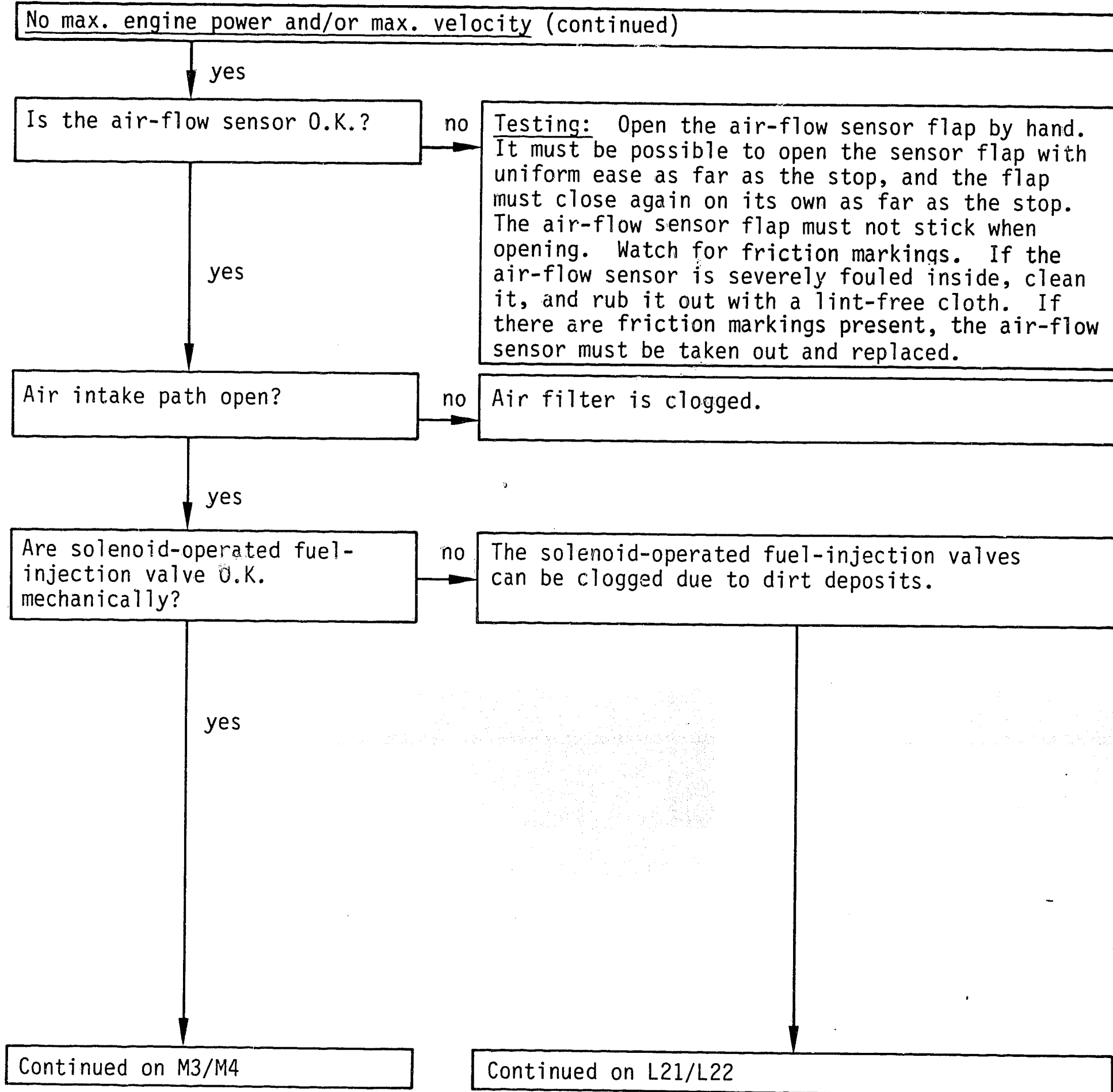
No max. engine power
BMW 325e (USA)



L18

No max. engine power
BMW 325e (USA)

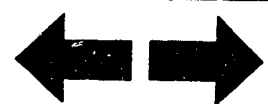




1 = Air-flow sensor with NTC I
2 = Idle-mixture-adjusting screw

L19

No max. engine power
BMW 325e (USA)



L20

No max. engine power
BMW 325e (USA)



No max. engine power and/or max. velocity (continued)

Taking out the solenoid-operated fuel-injection valves

Release the fastening screws on the fuel distribution pipe. Pull the fuel distribution pipe up until the solenoid-operated fuel-injection valves are out of the hole in the intake manifold. Do not damage the nozzle needles or the rubber gasket.

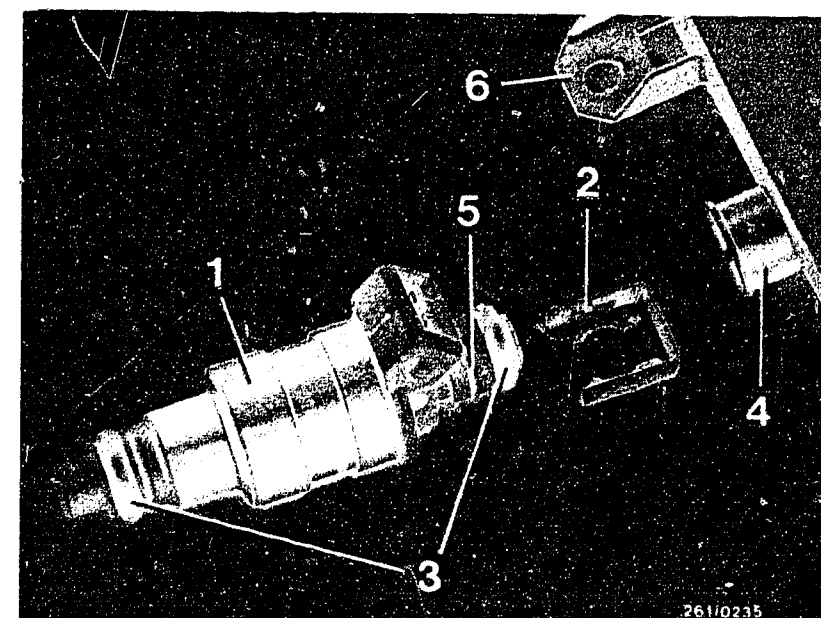
Check the nozzle needles and the area around them for tightness of seal and for dirt deposits. Disconnect the electrical connection. Carefully shove the holding bracket out of the slot and pull the solenoid-operated fuel-injection valve out of the fuel-distribution pipe connection.

yes

Continued on M3/M4

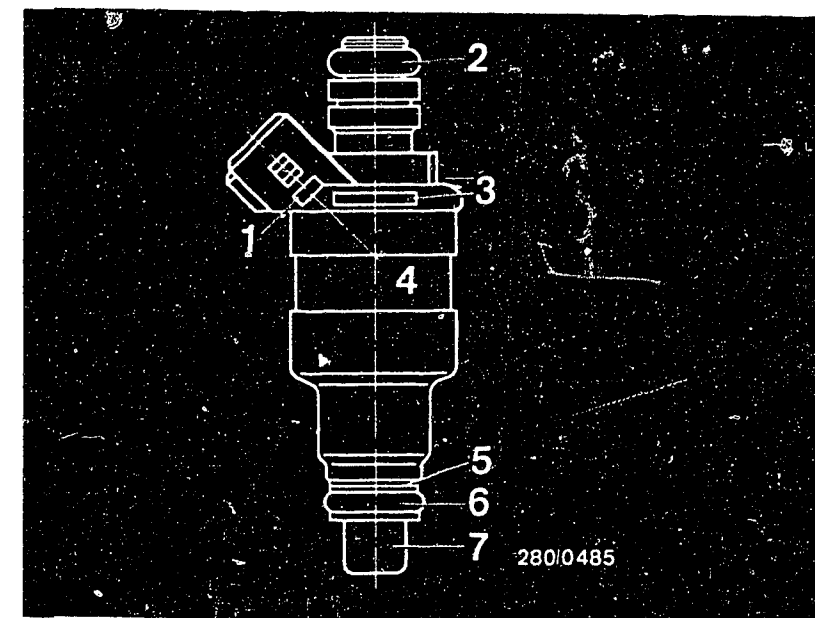
yes

Continued on M1/M2



- 1 = Solenoid-operated fuel-injection valve
- 2 = Holding bracket
- 3 = Rubber gasket
- 4 = Fuel distribution pipe connection
- 5 = Slot
- 6 = Fastening tab

- 2 = Top O-ring
- 6 = Bottom O-ring
- 7 = Protection sleeve



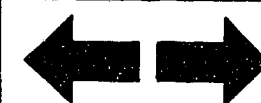
L21

No max. engine power
BMW 325e (USA)



L22

No max. engine power
BMW 325e (USA)



No max. engine power and/or max. velocity (continued)

yes

Caution!

Catch any fuel that runs out. Do not allow it to drip on hot portions of the engine. Fire hazard!

Caution!

The protection sleeve must not be pried off.

Installation of the solenoid-operated fuel-injection valves

Take out and replace damaged or swollen O-rings.

Use set of parts 1 287 010 704.

Cut the lower O-ring (intake tube) into pieces.

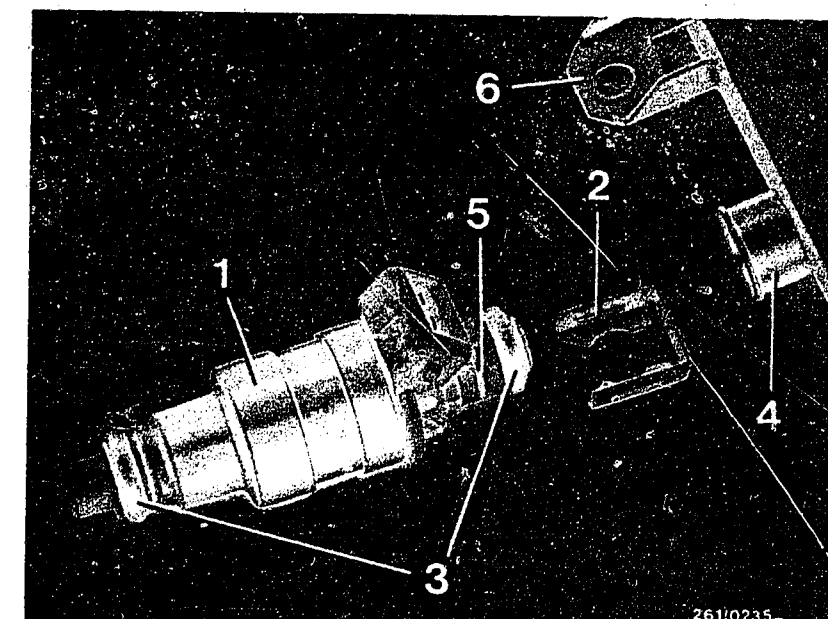
Caution! Do not damage the protection sleeve.

Pull a new O-ring over the protection sleeve and the shoulder on it. Do not damage any parts in so doing.

Before installation, check both rubber gaskets for proper seating. Fasten the solenoid-operated fuel-injection valves to the fuel distribution pipe. All solenoid-operated fuel-injection valves are to be pressed into the seats at the same time using fuel distribution pipe. Screw the fuel distribution pipe tight. Check all air and fuel hoses for proper seating.

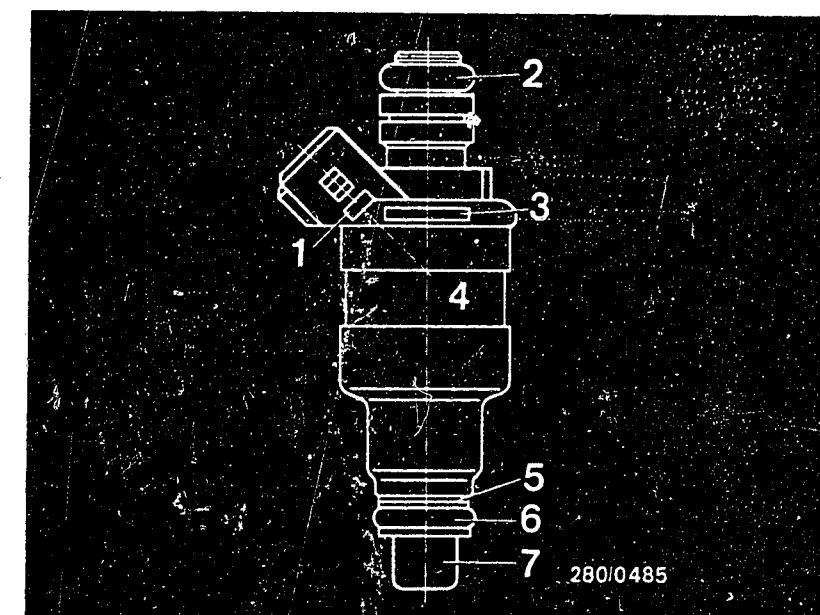
Make electrical connections.

Start the engine and check that no unmetered air is being drawn in.



- 1 = Solenoid-operated fuel-injection valve
- 2 = Holding bracket
- 3 = Rubber gasket (O-ring)
- 4 = Fuel distribution pipe connection
- 5 = Slot
- 6 = Fastening tab

- 2 = Top O-ring
- 6 = Bottom O-ring
- 7 = Protection sleeve



Continued on M3/M4

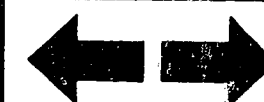
M1

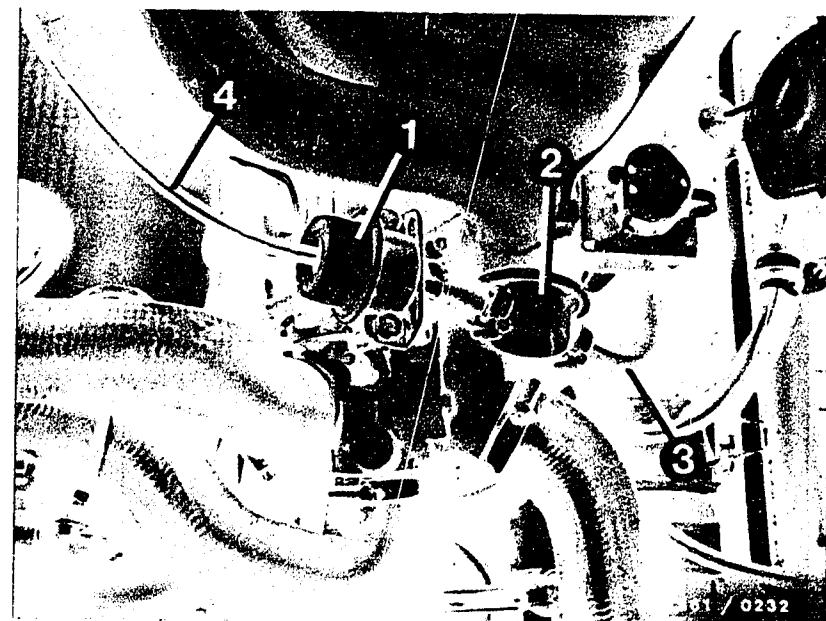
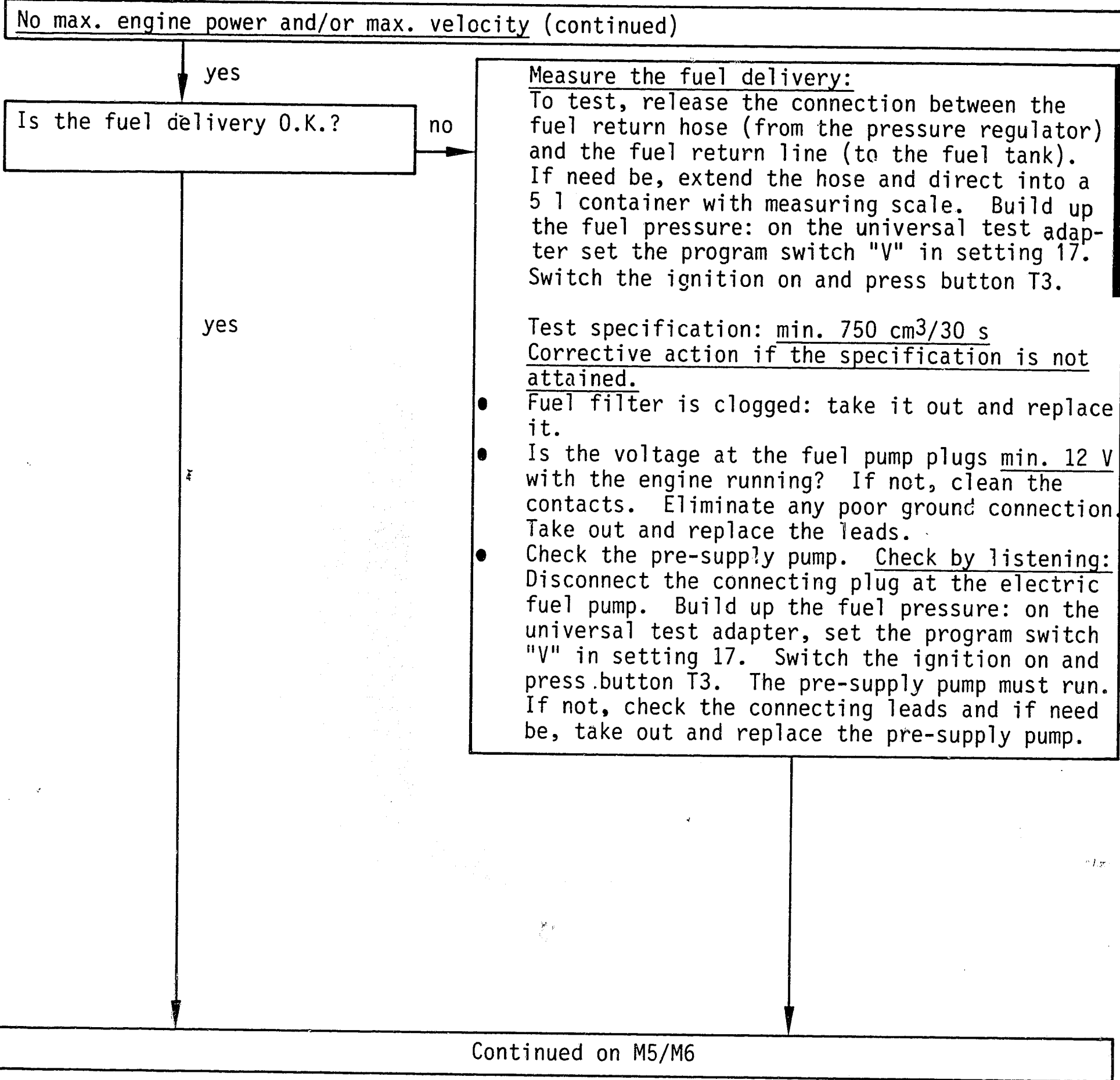
No max. engine power
BMW 325e (USA)



M2

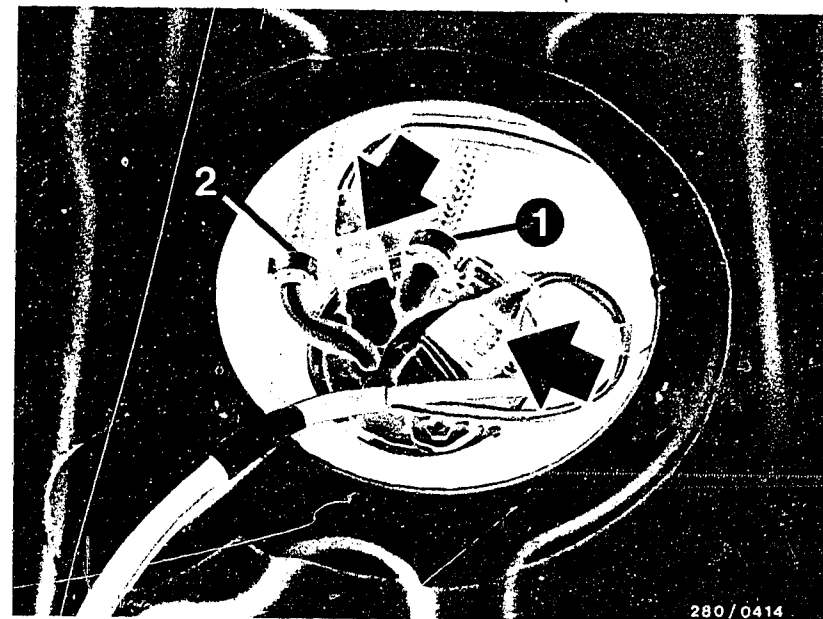
No max. engine power
BMW 325e (USA)





- 1 = Pressure regulator
- 2 = Fuel-line-pressure damper
- 3 = Fuel return line
- 4 = Air hose to the intake manifold

- 1 = Fuel delivery line to the electric fuel pump
- 2 = Fuel return line
- Arrows = Connection plug, 2-pole; pre-supply pump, 3-pole, immersion



M3

No max. engine power
BMW 325e (USA)



M4

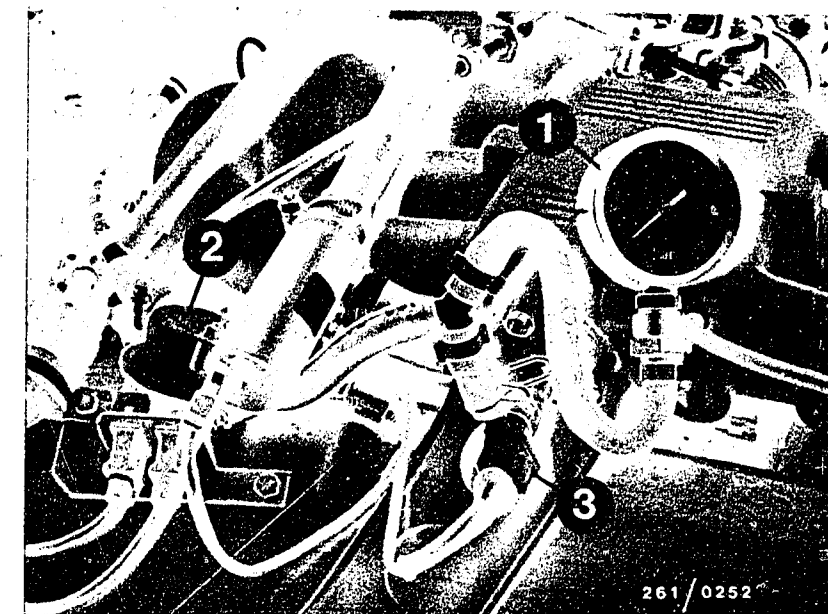
No max. engine power
BMW 325e (USA)



No max. engine power and/or max. velocity (continued)

yes

- The fuel pressure regulator is defective: take it out and replace it. The fuel pressure regulator is fastened to the fuel distribution pipe using two fastening screws and across an O-ring. After the pressure regulator is taken out, the O-ring and the flat ring must be taken out and replaced. (Use set of parts 1 287 010 704).
- The fuel pump output is too low: take out and replace the fuel pump.
- Is the filter in the tank clogged? Is there corrosion in the tank?



- 1 = Pressure gauge
2 = Fuel-line-pressure damper in the fuel delivery line
3 = Start valve

Is the fuel pressure at full load O.K.?

no

Put a pressure gauge into the fuel distribution pipe (delivery line).

Caution:

Catch any gasoline that runs out. Fire hazard with engine hot and electrical sparks!

Have engine run at idle: fuel pump pressure approx. 2.0 bar.

Disconnect the air hose to the intake manifold at the pressure regulator:

Fuel pump pressure: 2.3 ... 2.7 bar.

(The reading may fluctuate slightly.)

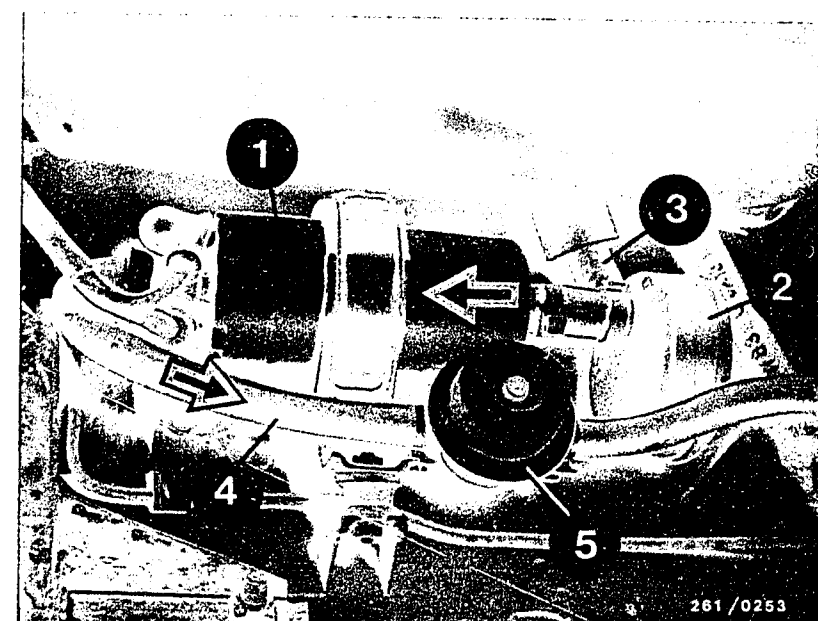
Plug the air hose back on. Check the fuel pressure at nominal engine speed and nominal power output on the chassis dynamometer:

Fuel pressure at full load: 2.3 ... 2.7 bar. (Reading may fluctuate slightly.)

yes

Continued on M9/M10

Continued on M7/M8



- 1 = Electric fuel pump
2 = Fuel spinner
3 = Fuel intake line
4 = Fuel delivery line
5 = Fuel-line-pressure damper
Arrows = Direction of fuel flow

M5

No max. engine power
BMW 325e (USA)



M6

No max. engine power
BMW 325e (USA)

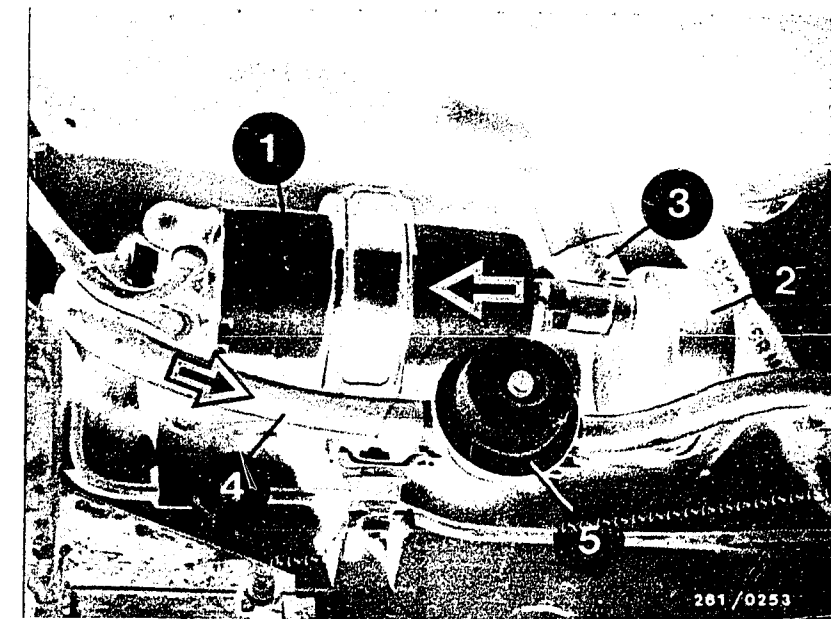


No max. engine power and/or max. velocity (continued)

yes

Trouble-shooting:

- Fuel filter is clogged: take it out and replace it.
- Is the voltage at the fuel pump plugs min. 12 V with the engine running? If not, clean the contacts. Eliminate any poor ground connection. Take out and replace the leads.
- Check the pre-supply pump. Check by listening: Disconnect the connecting plug at the electric fuel pump. Build up the fuel pressure: on the universal test adapter, set the program switch "V" in setting 17. Switch the ignition on and press button T3. The pre-supply pump must run. If not, check the connecting leads and if need be, take out and replace the pre-supply pump.
- The fuel pressure regulator is defective: take it out and replace it.
The fuel pressure regulator is fastened to the fuel distribution pipe using two fastening screws and across an O-ring. After the pressure regulator is taken out, the O-ring and the flat ring must be taken out and replaced. (Use set of parts 1 287 010 704).
- The fuel pump output is too low: take out and replace the fuel pump.
- Is the filter in the tank clogged? Is there corrosion in the tank?



- 1 = Electric fuel pump
2 = Fuel spinner
3 = Fuel intake line
4 = Fuel delivery line
5 = Fuel-line-pressure damper
Arrows = Direction of fuel flow
1 = Fuel delivery line to the electric fuel pump
2 = Fuel return line
Arrows = Connection plug, 2-pole: pre-supply pump, 3-pole, immersion tube sensor

Continued on M9/M10

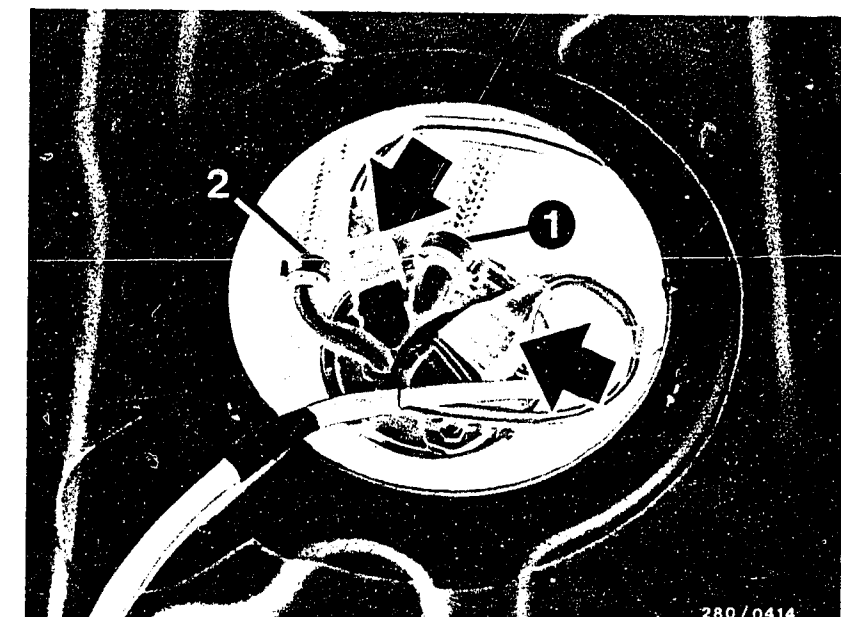
M7

No max. engine power
BMW 325e (USA)



M8

No max. engine power
BMW 325e (USA)



No max. engine power and/or max. velocity (continued)

yes

Are all the hose lines and electrical lead connections put on correctly? Visual inspection. Has the intake system been checked for leaks?

no

Check that the hoses on the air intake system and the fuel line system are put on correctly, without kinking or damage. If need be, take out and replace the hoses. Eliminate leaks by using new gaskets or by tightening the connecting screws.

Testing for leaks: Seal off the exhaust pipe and the air inlet point on the air filter. Disconnect the hose between the air-flow sensor and the idle actuator at the air-flow sensor. Seal off the hose opening to the idle actuator and using a compressed air gun (0.3 bar gauge pressure), blow into the intake manifold. In so doing, open the throttle valve fully. Brush or spray soapy water on all joints after the air-flow sensor flap. Bubbling or foaming indicates leaks. Check electrical plug contacts for loose contacts.

yes

Checking the customer complaint

"No max. engine power"

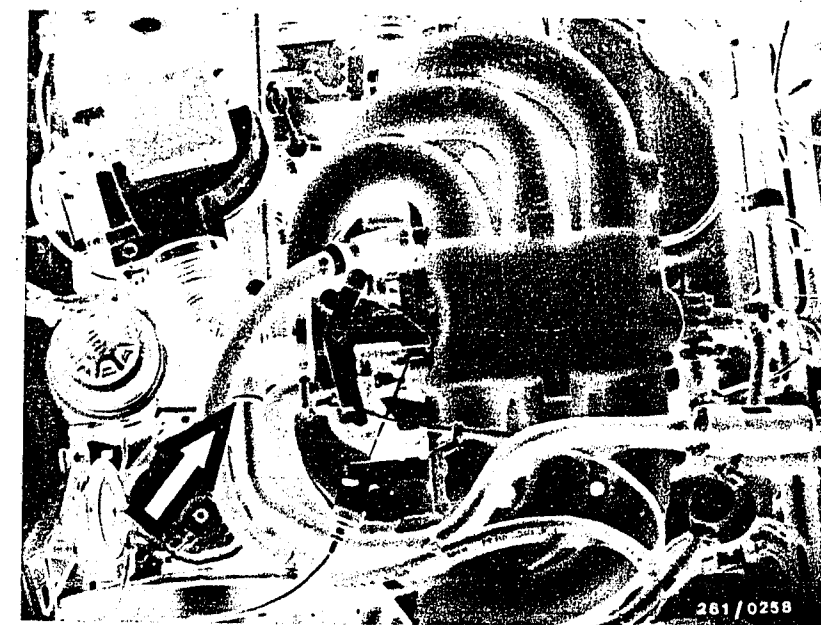
has been completed.

Has the customer complaint been corrected?

no

Additional possible defects

- The customer complaint has been incorrectly identified. (See Coordinates C3 ... C10.) If the defect has not been identified using the "Targeted Trouble-Shooting" see "Detailed Trouble-Shooting" (Coordinates C3/C4).
- Engine is not O.K. mechanically. (Compression, valve setting, valve timing, wear on camshaft).



Arrow = Disconnect hose here for leak test.

M9

No max. engine power

BMW 325e (USA)



M10

No max. engine power

BMW 325e (USA)



CO-LEVEL AT IDLE TOO LOW OR TOO HIGH

Trouble-shooting program according to customer complaint

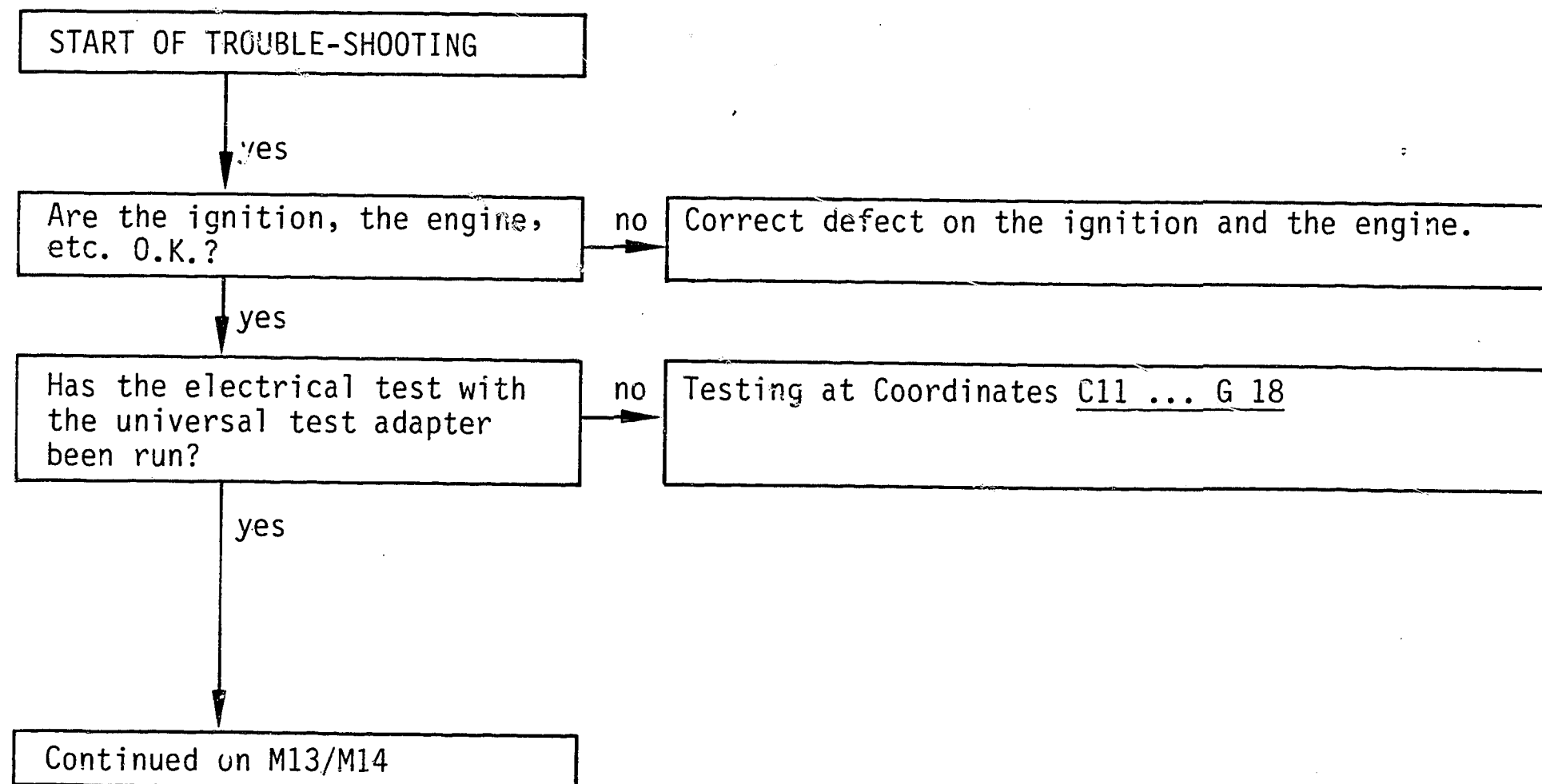
How to use the program

Testing is organized into 3 columns of boxes:

- In the column at the left are the questions for the tests being run.
- In the column in the center the component tests and settings are described.
- The column at the right shows the figures belonging to the text and the legend for the figures.

If it is possible to answer the questions clearly with "yes" even without testing, proceed to the next question below.

On the other hand, if the answer to the question is "no", and a defect is suspected, you must switch to the center column of boxes and carry through the tests indicated there. At the end of the test, the trouble-shooting is continued at that point at which the shift was made previously.



M11

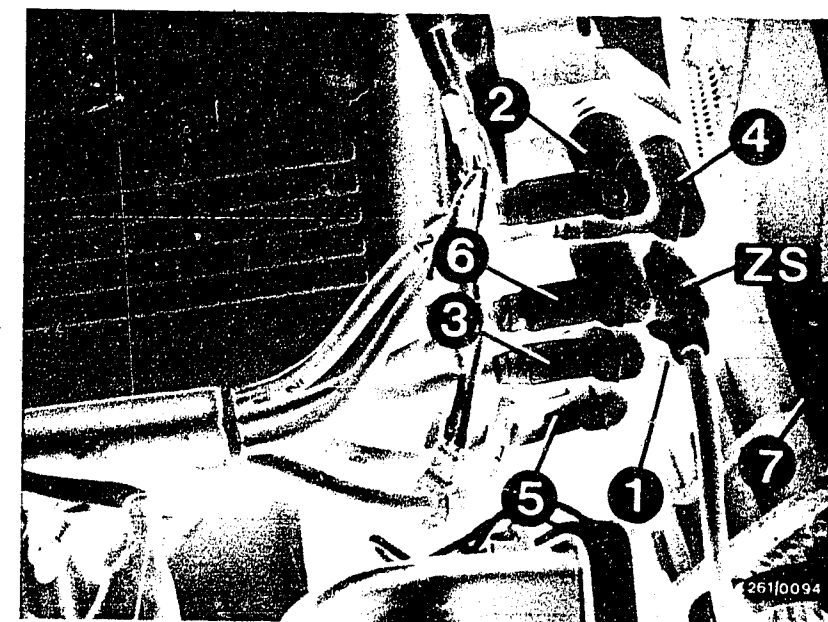
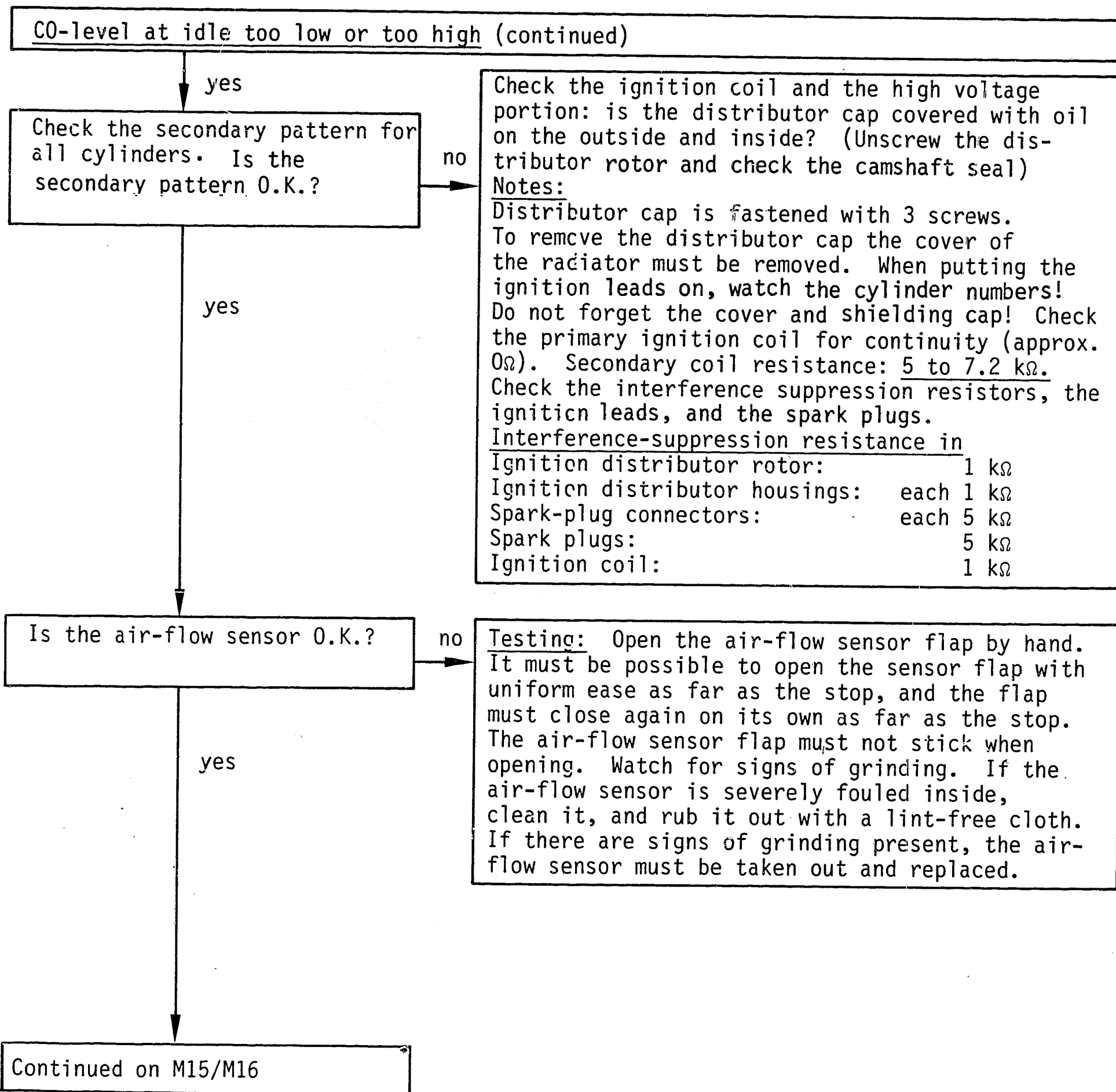
CO-adjustment
BMW 325e (USA)



M12

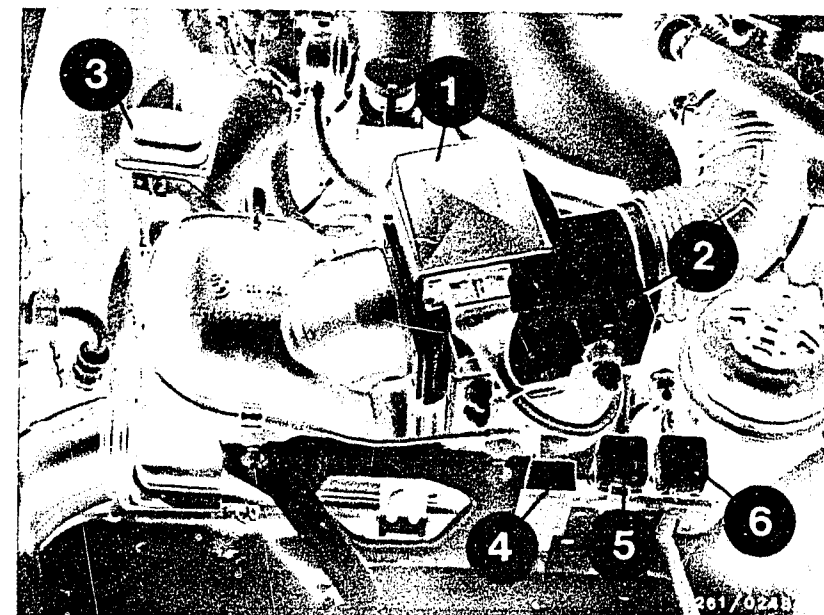
CO-adjustment
BMW 325e (USA)





High voltage distributor
 1 - 6 = Cylinder numbers
 ZS = High voltage lead to the
 ignition coil
 7 = Radiator cover

1 = Air flow sensor with NTC I
 2 = Idle-mixture-adjusting screw



M13

CO-adjustment
 BMW 325e (USA)



M14

CO-adjustment
 BMW 325e (USA)



CO-level at idle too low or too high (continued)

yes

Is the start valve O.K.?
(Test for leaks)

no

Check the start valve for leaks:

1. In the engine

Clamp off the fuel delivery line at the start valve. If the engine then runs smooth, take out and replace the start valve.

2. Taken out of the engine

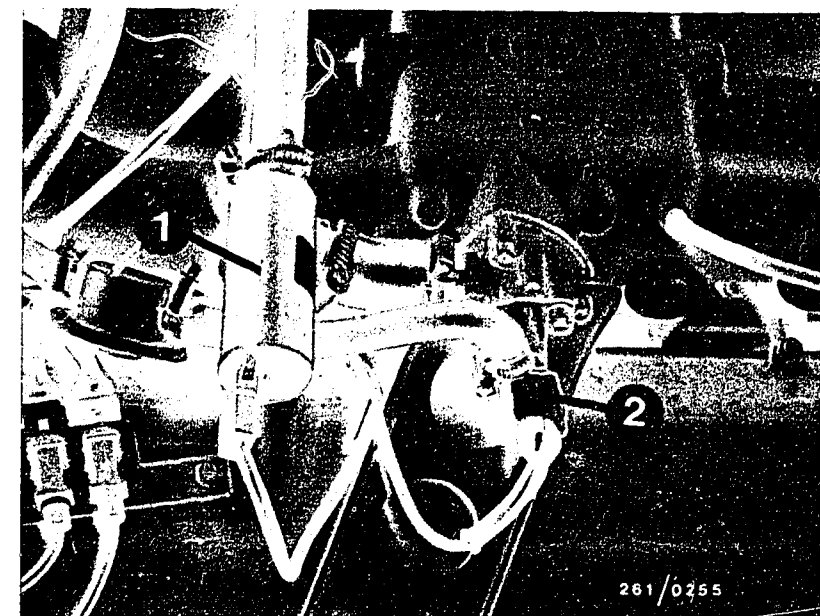
Take out the start valve. (Caution: fire hazard!) The fuel and the electrical lines remain connected. (Place a catch basin under the start valve.)

Build up the fuel pressure: on the universal test adapter, set the program switch "V" at setting 17. Switch ignition on, and press button T3.

Test specification: the formation of max. 1 drop is permissible at the opening of the valve within one minute.

yes

Continued on M17/M18



1 = Idle actuator
2 = Start valve

M15

CO-adjustment
BMW 325e (USA)



M16

CO-adjustment
BMW 325e (USA)



CO-level at idle too low or too high (continued)

yes

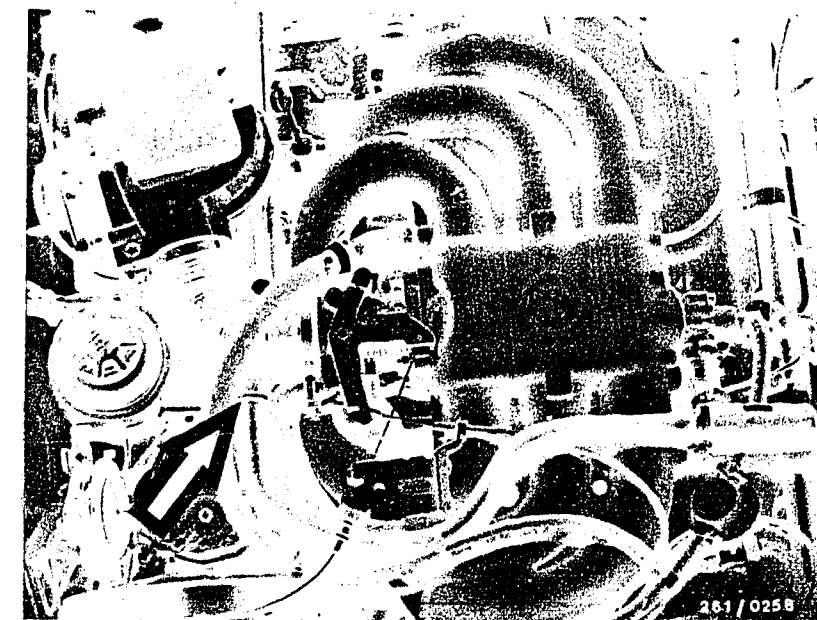
Are all the hose lines and electrical lead connections put on correctly? Visual inspection. Has the intake system been checked for leaks?

no

Check that the hoses on the air intake system and the fuel line system are put on correctly, without kinking or damage. If need be, take out and replace the hoses. Eliminate leaks by using new gaskets or by tightening the connecting screws. Testing for leaks: Seal off the exhaust pipe and the air inlet point on the air filter. Disconnect the hose between the air-flow sensor and the idle actuator at the air-flow sensor. Seal off the hose opening to the idle actuator and using a compressed air gun (0.3 bar gauge pressure), blow into the intake manifold. In so doing, open the throttle valve fully. Brush or spray soapy water on all joints after the air-flow sensor flap. Bubbling or foaming indicates leaks. Check electrical plug contacts for loose contacts.

yes

Continued on M19/M20



Arrow = Disconnect hose here for leak test.

M17

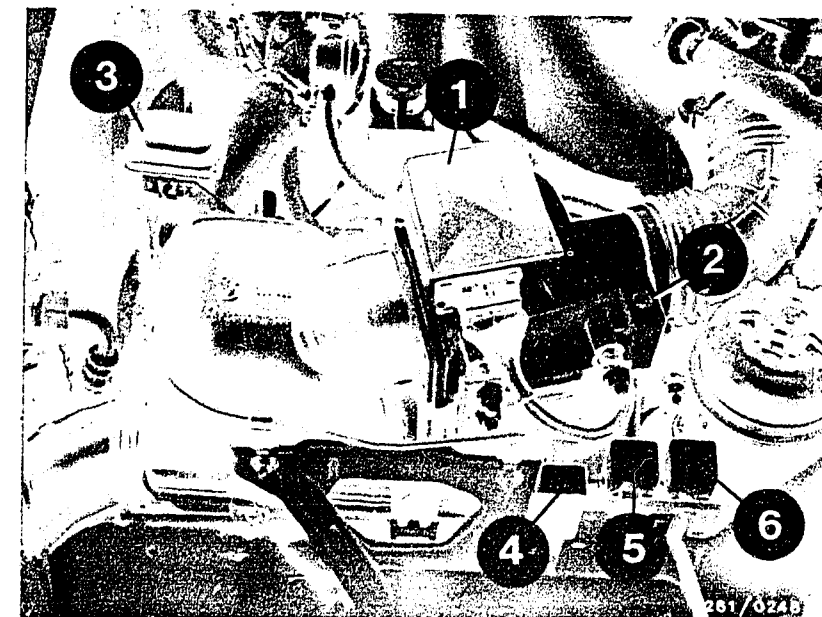
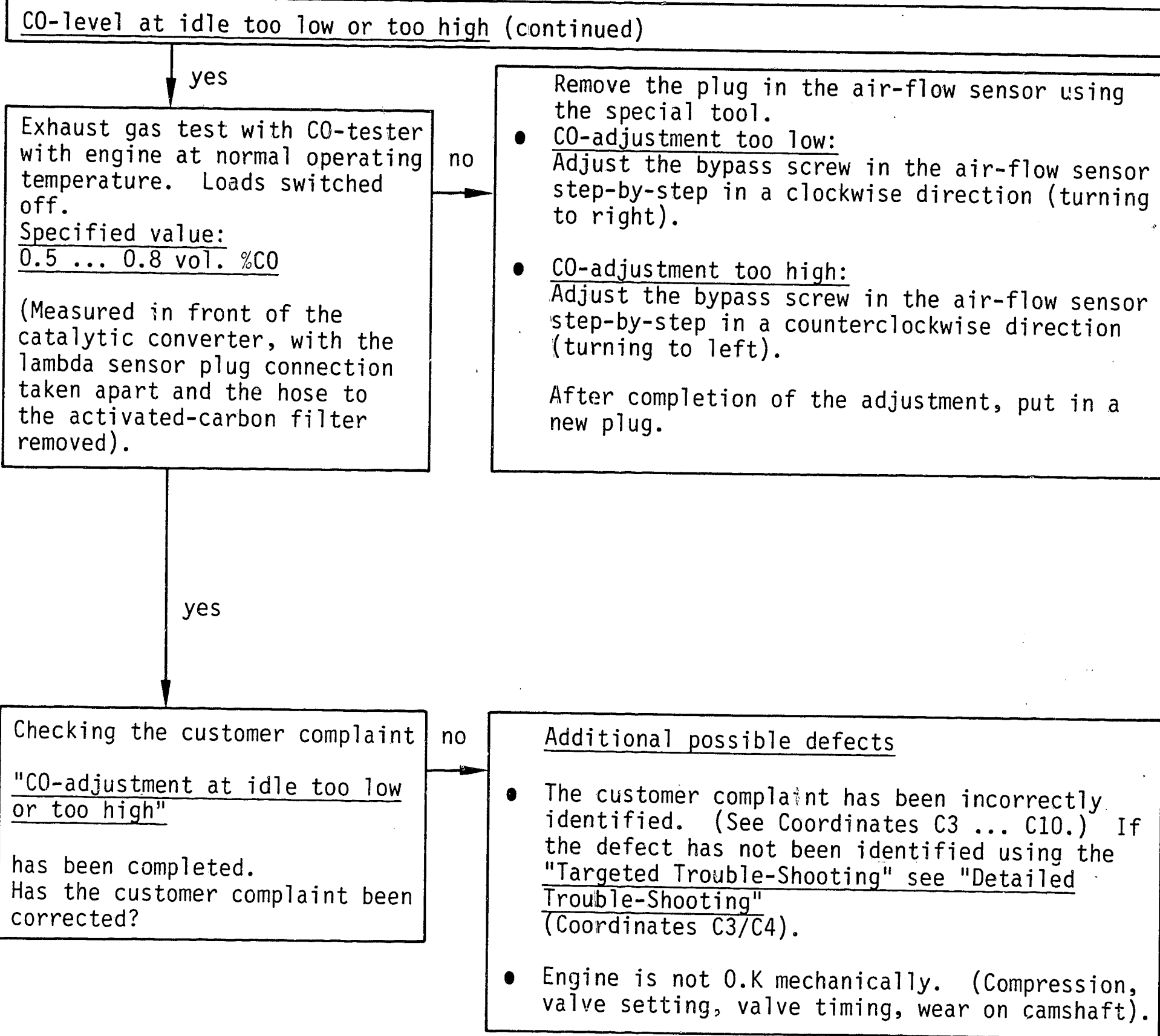
CO-adjustment
BMW 325e (USA)



M18

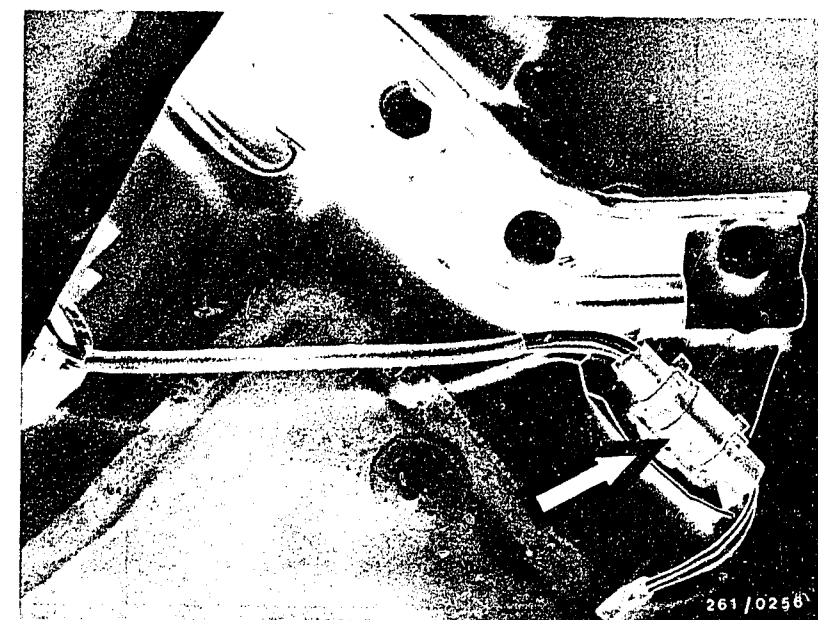
CO-adjustment
BMW 325e (USA)





1 = Air-flow sensor with NTC I
2 = Idle-mixture-adjusting screw

Arrow = Plug connection for the lambda sensor



M19

CO-adjustment
BMW 325e (USA)



M20

CO-adjustment
BMW 325e (USA)



After-sales Service

Technical Bulletin

Only for use within the Bosch organization. Not to be communicated to any third party

13...39

VDT-I-261/102 En

6.1983

PARTS SET FOR SOLENOID-OPERATED INJECTION VALVES

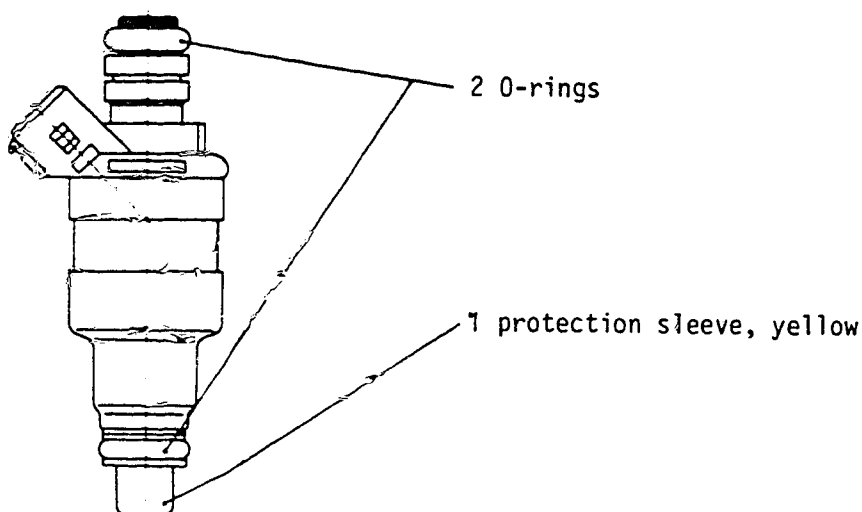
Supersedes 8.1982 edition

0 280 150 2..

AND PRESSURE REGULATORS 0 280 160 2..

A common parts set is available for the Motronic solenoid-operated injection valves and pressure regulators with the new method of connection.

Contents for 1 injection valve:



Contents for pressure regulator:

1 O-ring

1 supporting plate

Since the above-mentioned parts are subjected to extreme temperature stress, they should be exchanged for new parts whenever servicing is carried out.

"Unmetered air" sucked in through injection-valve seals which are not tight, is a frequent case for servicing.

The parts set has the part number 1 287 010 704 and will in future be listed in the service parts microfiche under solenoid-operated injection valves (see EE 00 under 0 280..).

Please direct questions and comments concerning the contents to our authorized representative in your country.

BOSCH

Geschäftsbereich KH, Kundendienst, Kfz-Ausrüstung
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Imprimé en République Fédérale d'Allemagne par Robert Bosch GmbH

N1

Technical Bulletin

BMW 325e (USA)



Technical Bulletin

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28

PLUG CONNECTORS FOR
JETRONIC COMPONENTS
Parts sets

VDT-I-280/111 En

11.1984

(supersedes edition 11.1982)

Parts sets are available for replacement of Jetronic plug connectors. These consist of:

- Plug connector housing
- Protective cap (rubber sleeve)
- Contact springs

These parts are listed on microfiche EE...*.

* see microfiche EE00 under 0 280 ..

- Plug, black, 2-pin,
parts set 1 287 013 002 cable connector in conjunction with socket, 2-pin
- Socket, black, 2-pin,
parts set 1 287 013 001 for e.g.

Temperature sensor	0 280 130 0..
Auxiliary-air device	0 280 140 ..
Thermo-time switch	0 280 130 2..
Start valve	0 280 170 ..
Warm-up regulator	0 438 140 ..

- Socket, grey, 2-pin
parts set 1 287 013 003 for:

Solenoid-operated injection valve	0 280 150 ..
--------------------------------------	--------------

N2

Technical Bulletin

BMW 325e (USA)



- Socket, black, 3-pin,
parts set 1 237 000 039 for:

Throttle-valve switch 0 280 120 ..

- Socket, black, 5-pin,
parts set 1 287 013 006 for:

Air-flow sensor 0 280 20. ..
(LE version)

- Socket, black, 6-pin,
parts set 1 287 013 004 for

Air-flow sensor 0 280 200 ..

- Socket, black, 7-pin,
parts set 1 287 013 005 for:

Air-flow sensor 0 280 20. ..
Air-mass sensor 0 280 211 ..

- Wiring-harness plug connector, black, 25-pin
parts set 1 287 013 009 for:

Control unit 0 280 0..

- Wiring-harness plug connector, black, 35-pin,
parts set 1 287 013 008 for:

Control unit 0 280 0..

The contact springs (minitimers) are also available separately under part no. 1 284 477 026.

The plug-connector housings are only available in the stated colours.

Responsible:

Robert Bosch GmbH

Division KH

Technical After-Sales Service (KH/VKD 2)

Please direct questions and comments concerning the contents to our authorized representative in your country.



TABLE OF CONTENTS

In the targeted trouble-shooting on a given Motronic component, it is absolutely necessary to look for the component being sought under the pertinent customer complaint.

<u>Section</u>	<u>Coordinates</u>
Structure of the microfiche	A 1
1. Rapid diagnostic chart	A 2 - A 16
2. Test specifications	A 17 - A 18
3. Electrical connection diagram	A 19 - A 22
4. Installation position of the components	A 23 - B 1
5. Fuel line diagram	B 2
6. Test equipment and tools	B 3 - B 4
7. General instructions	B 5 - B 7
8. Trouble-shooting	C 1 - C 10
8.1 Detailed trouble-shooting	C 3 - C 4
8.2 Targeted trouble-shooting	C 5 - C 10
9. Testing with universal test adapter	C 11 - G 18



Table of contents (continued)

10. Trouble-shooting program according to customer complaint

Coordinates

STARTING MOTOR TURNS, ENGINE DOES NOT
START OR STARTS ONLY WITH DIFFICULTYG 19 - H 16

Secondary patternsG 21 - G 22

Solenoid-operated fuel-injection valvesG 21 - H 2

Idle speed controlH 3 - H 4

Start valveH 5 - H 10

Thermotime switchH 11 - H 12

Air-flow sensorH 13 - H 14

Hose lines, electrical lead connections,
and test for leaksH 13 - H 14

ENGINE STARTS AND THEN DIESH 17 - J 4

Hose lines, electrical lead connections, and
test for leaksH 19 - H 20

Idle speed controlH 21 - H 22

Start valveH 23 - H 24

Thermotime switchJ 1 - J 2

Air-flow sensorJ 3 - J 4



Table of contents (continued)

Coordinates

ROUGH IDLE AND/OR INCORRECT IDLE SPEEDJ 5 - J 20

Secondary patterns	J 7 - J 8
Air-flow sensor	J 7 - J 8
Hose lines, electrical lead connections, and test for leaks	J 9 - J 10
Idle speed control	J 11 - J 12
Thermotime switch	J 13 - J 14
Start valve	J 13 - J 14
Solenoid-operated fuel-injection valves	J 15 - J 18
Idle speed and CO-adjustment	J 19 - J 20

POOR THROTTLE TAKE-UPJ 21 - K 12

Secondary patterns	J 23 - J 24
Is the throttle valve closed?	K 1 - K 2
Air flow sensor	K 3 - K 4
Hose lines, electrical lead connections, and test for leaks	K 5 - K 6
Solenoid-operated fuel-injection valves	K 5 - K 10
Idle speed control	K 11 - K 12

ENGINE MISSING IN ALL DRIVING CONDITIONSK 13 - L 2

Secondary patterns	K 15 - K 16
Plug connections	K 15 - K 16
Air-flow sensor	K 17 - K 18
Fuel delivery	K 19 - K 22
Engine coughing on overrun	K 21 - K 24
Control unit	K 23 - K 24
Alternator	L 1 - L 2
Interference suppression	L 1 - L 2
Spark-plug connectors	L 1 - L 2



Table of contents (continued)

	<u>Coordinates</u>
<u>POOR MILEAGE</u>	L 3 - L 16
Secondary patterns	L 7 - L 8
Start valve	L 9 - L 10
Air-flow sensor	L 11 - L 12
Solenoid-operated fuel-injection valves	L 11 - L 14
Idle speed and CO-adjustment	L 15 - L 16
<u>NO MAX. ENGINE POWER AND/OR MAX. VELOCITY</u> ...	L 17 - M 10
Secondary patterns	L 19 - L 20
Does the throttle valve open all the way? ...	L 19 - L 20
Air-flow sensor	L 21 - L 22
Air-intake path	L 21 - L 22
Solenoid-operated fuel-injection valves	L 21 - M 2
Fuel delivery	M 3 - M 6
Fuel pressure at full load	M 5 - M 8
Hose lines, electrical lead connections, and test for leaks	M 9 - M 10
<u>CO-LEVEL AT IDLE TOO LOW OR TOO HIGH</u>	M 11 - M 20
Secondary patterns	M 13 - M 14
Air-flow sensor	M 13 - M 14
Start valve	M 15 - M 16
Hose lines, electrical lead connections, and test for leaks	M 17 - M 18
Exhaust gas adjustment	M 19 - M 20
Technical Bulletins	N 1 - N 3



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Automotive Equipment - After-Sales Service
Department for Technical Publications KH/VDT
Postfach 50, D-7000 Stuttgart 1

Published by: After-Sales Service
Department for Training and Technology (KH/VSK).
Published 12.1984.

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Microfilmed in the Federal Republic of Germany. Micro-
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